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# THE PRACTITIONER.

JULY, 1909.

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## NOTES RESPECTING THE DIETARY FOR GOUTILY-DISPOSED PERSONS.

By SIR DYCE DUCKWORTH, BART., M.D., LL.D., HON. F.R.C.P.I.,

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*"Some physicians are so regular in proceeding according to art for the  
disease, as they respect not sufficiently the condition of the patient."*

Bacon's Essays: "*Of Regimen of Health.*" 1597.

THE fact that gout has long been regarded as a disorder dependent on errors of digestion and systemic metabolism has led to many observations respecting the influence of various articles of diet upon the production and course of the disease. Such a study is no easy matter, and to secure a sound and practical knowledge of it requires long experience, calm judgment, and a mind free from any bias that may tend to pervert it.

It can hardly be doubted that many, if not all, of the dietetic methods practised to-day are founded on the commonly accepted theory which is held as to the pathogeny of gout,—to wit, its dependence on an abnormal production or disposal in the system of uric acid and its immediate congeners.

In this brief essay, I am not concerned to touch particularly on this point. I have elsewhere expressed my belief that gout is not a purely humoral disorder, but is dependent on a neuro-humoral pathogeny.<sup>1</sup> By most authorities uric acid is regarded as the touchstone of the disorder, and some even go so far as to declare that to establish the diagnosis of gout or goutiness in any instance, there must be demonstrable evidence of this substance. I will only remark in passing that such pedants will

have long to wait if they insist on this evidence.

In any case, it is certain, first, that the peccant matter of gout is produced within the body, and is thus auto-toxæmic, not entering infectively from without as is the case in rheumatic or other varieties of toxæmia; and, secondly, that the subject of gout, either by inheritance or acquirement, is so far peculiar in his constitution that he reacts differently to various agencies, such as climate, food, &c., from persons not so disposed. The metabolic reactions of the gouty are abnormal.

I am of opinion that many of the methods in practice relating to diet as well as to therapeutics for gout are founded mainly on the principle of treatment for the *disease*, and not for the *patient*. To state this in another way, the *patient* is not regarded in the proper light, or is disregarded, and all the efforts to set him right are directed against the perturbations of uric acid. This is not the true clinical method, and it constitutes a radical fault in practice. Men and women are not so many ninepins or human units invaded by morbid agencies. No two individuals, indeed, are precisely alike in respect of their constitution or metabolic processes. In this sense, then, there is no treatment for gout, and no special diet for the gouty, as such, but there is a treatment and a management for the particular patient who manifests symptoms of gout. The same principle, of course, applies to patients suffering from pneumonia, or from renal, tubercular, or any other maladies. The neglect of the personal factor in each patient narrows the field of observation, and tends to stereotype the practice of those who work in special departments of medicine. The great whole is lost in a part, often a very small part, of the case, and the acumen of a widely-exercised physician is not brought to bear upon it.

A study for a few minutes of the peculiarities of gouty patients can hardly justify any dogmatic assertions as to the diet required, or fairly authorise the over-elaborate prescriptions sometimes to be met with, which have been placed in their hands. In many instances these patients have already discovered for themselves what manner of diet best agrees with them. They can often blame no indiscretion or irregularity as to food for the onset of acute, or the continuance of lingering, symptoms. Sometimes this personal experience has led them rightly. More often the articles of food omitted or introduced



have been denounced or recommended by lay friends, or the practice has been gathered from some unauthorised or untrustworthy source, and no benefit has been derived from it.

The histories afforded in some cases reveal at times an extraordinary and even a ludicrous series of recommendations as to diet.

Thus, it is not seldom declared that no red meats are to be taken by gouty persons, but the white meats, fish, and game are allowable. Again, beef is generally condemned, while mutton is regarded as permissible. Some authorities are of opinion that all forms of animal food are gout-provoking. In Germany some physicians condemn fowl as directly productive of the disorder. In some quarters, too, all salted food, sweetbread, and other viscera are excluded. With respect to other articles of diet, we find ordinary bread sometimes forbidden, while sugar is almost universally struck off the list of permissible foods. Common salt is excluded, and tea and coffee are regarded by some as direct doses of uric acid. Potatoes are condemned in common with all things that grow underground. Many patients are warned never to eat any kind of fruit. Wine and all fermented liquors are forbidden.

In this strange enumeration I have not drawn upon my imagination, but have simply told of prescriptions from various sources which have come under my own observation. The sad fact remains that, having undergone most of these varied dietetic experiments, the majority of sufferers still remain more or less gouty, and continue to seek further advice. We may well ask how much ordinary food fit for human beings is left for such patients to consume, and wonder whether gouty patients are to be regarded as beings from some other planet, since they can hardly be expected to fight the battle of life on such conditions amidst our present environment.

As I have already stated, these curious prescriptions are the result of efforts to treat gout without reference to the patient. It is sometimes forgotten that in all diseases the best possible nutrition of the body has to be secured. "The King's Government must be carried on." Patients may submit for a time to certain severe deprivations, but seldom for an indefinite period unless they find real benefit from the specific regimen. They not seldom learn for themselves what articles of food

disagree with them or tend to provoke gouty symptoms.

We may now inquire more particularly as to the real inwardness of some of the dietetic methods just described. With respect to *animal food* generally, it may be declared at once that it is not only harmless, but beneficial, to gouty persons, provided it be taken in moderation. The alleged difference between red and white meats demands consideration. Anybody can readily understand that tender mutton is more digestible than tough beef. The notion as to the permissibility of white meats has come in all probability from the Continent, where the ordinary white meat is veal, a very different and superior article of food to any that can be procured in this country, and where beef and mutton are very inferior in texture and flavour to the products of Great Britain and her Colonies. Some intelligent and observant gouty patients declare that beef is more apt to induce pains and gouty disturbance than mutton or game. They also distinctly find that chicken is more harmful than beef. There is no rule in these matters applicable to all gouty persons. The most important points to attend to are that the quantity eaten is restricted, and the cooking is simple and appropriate.

Liver and sweetbread are not to be recommended.

We here are in face of the more recent teachings respecting a purin-free diet. A too exclusive attention to such prescription is not within the realm of sound medical practice. Occasionally we meet with individuals who find their best health, and immunity from gouty ailments, in employing a purin-free diet, but it is not appropriate for others, or may only be taken for a short period with benefit. Strong meat soups, hare soup, and beef extracts are to be avoided. Thin consommé, lentil, spinach, and artichoke soup may be taken.

Pickled or salted meats are, as a rule, inadvisable, but they need not be absolutely excluded from the dietary. Fish, especially white and fresh, is one of the best articles of diet for the gouty. Lobsters, oysters, and most shell-fish are quite innocuous provided they are eaten in good condition.

With regard to *vegetable* food, ordinary bread, plain or toasted, or plain biscuits are, of course, permissible. It is hard to understand why potatoes should be forbidden.

Certainly, the largest eaters of them know nothing of gout. Plainly cooked, they are quite harmless. It may be remarked here that certain dyspeptics are better able to digest separately a meal of proteids or of carbohydrate food, and suffer from the effects of a mixture of both, but this disability is not peculiar to gouty subjects. The assertion that roots and vegetables grown underground are harmful I fail to understand, and I have no knowledge of any ill-effects from their employment by the gouty. Fruit is condemned for very inadequate reasons. Some gouty patients are certainly better without any variety of it, but most of them can take fruit, cooked or raw, in moderation at proper times of the day, and apart from meals, not only with impunity, but with benefit. Tea, cocoa, and coffee, properly prepared, are quite harmless: the greatest consumers of these know nothing of gout. Strong black coffee taken habitually after meals is not advisable. Sugar taken in moderation I regard as not only harmless, but beneficial. On theoretical grounds a purely vegetable diet is extolled by some as a means of averting gout. As such a diet, were it attainable, is condemned by physiology, no less than by common sense, for the majority of mankind, it needs no consideration here. Certain vegetable foods are useful for gouty subjects, especially spinach, the various cruciferæ (including the cresses); also celery (preferably cooked). Asparagus should be taken sparingly.

Respecting *wines* and alcoholic liquors generally there is much to be declared. It is certain that the least excess in any of them, or the use of inferior wines is harmful. So-called moderate drinkers of wine, as a rule, drink far too much. Many gouty persons are best without any. But the fact remains that many others are the better for the use of a little good wine, taken with one meal in the day. What that wine shall be is a matter of personal experience. The quantity must be well below what is commonly regarded (by men) as moderate. The capacity for adequate and beneficial disposal of it varies much in different individuals, and, further, must vary according to the habits, pursuits, and many personal factors in each case under consideration. There can, therefore, be no universal rule as to kind or amount. Much heed has to be paid to quality, season of the year, and preferences of the patient. Most varieties of malt-liquors are harmful to the majority of gouty subjects,



but in summer many can take small quantities of the lighter varieties, such as lager beer, or light ale with the addition of soda water, with impunity. One of the earliest symptoms indicating a gouty habit is an inability to digest even small quantities of malt-liquor. Well prepared cyder is an excellent drink in warm weather for many gouty patients, but the quantity should not exceed a pint.

Thus far I have in several respects combated the views which are commonly held regarding the appropriate diet for gouty persons. The main point which stands out is this, that a very large choice remains, which includes most of the edible and potable articles consumed by healthy individuals. What remains to be done is to find the particular diet which is suitable for each individual patient.

The general line of treatment in all cases is based on an effort to raise the level of health by whatever means are available. When this level is lowered from any cause, gout, or indications of its approach, may be expected to supervene in persons so predisposed. We find in practice that many sufferers are careful and prudent in diet, and commit no indiscretions. Their general tone is low. An improved and adjusted diet is helpful in such cases. To curtail their food and to send them to various spas is not helpful, but generally harmful. The class of gouty patients who live sumptuously, eating what amounts practically to two dinners daily, and habitually consuming what they regard as moderate quantities of light wine or whisky, require other treatment. This class, in the progress of what we are pleased to call modern civilisation, is a growing one, and the dietetic habits alluded to are not seldom associated with nervous exhaustion induced by strain of business or affairs, by endless rounds of pleasure-seeking, or the engagements of society, and with a deficient amount of sleep.

In these cases we have to moderate the intake of all varieties of food and stimulants, and especially to curtail the vicious items of the fashionable *menu*. Some of the startling prescriptions I have criticised may appeal to a few of these self-indulgent persons, but many of them have already earned strong proclivity to renewed attacks of gout by damage to the integrity and perfection of their hepatic and renal metabolism.



They find relief in regular visits to spas which stave off the evil days to come. The mischief commonly manifests itself late in the third decade, and a general plethora, with high arterial tension and a progressive obesity, paves the way to gouty outbursts either overt or larval.

Relief will come readily, not so much by omitting this or that particular article of food, as by a daily and systematic reduction of the whole amount consumed. What has especially to be forbidden is rich, seasoned, greasy, and twice-cooked food. Strong soups, cooked tomatoes, rhubarb, food cooked with fat or sugar, large mixed meals of animal and farinaceous foods, together with fruit and wine—all these are gout-provoking.

As a rule, the meals should consist of fresh food, plainly cooked, as by roasting or grilling. Much variety at any meal is apt to lead to excess.

Lemon-juice, sometimes freely taken for pains which are regarded as rheumatic, and are more often gouty, is sometimes very harmful and productive of gouty outbursts. Vinegar is to be avoided, as well as all sauces and relishes. Mustard may be freely taken. Salt should be very moderately used. A little good wine is certainly helpful for many elderly patients, but two to six ounces is sufficient, best taken with one meal only in the day. For most patients the wines of Burgundy, the Midi districts, Algeria, Hungary, California, and Australia are unsuitable. Claret, as grown in the Bordeaux district only, may disagree in some cases, but more often, as I believe, because half a bottle of it is taken when two glasses would suffice and be well disposed of. Taken with a little water, it is one of the safest wines to employ, and the same may be said of the lighter wines of the Moselle. There is little if any difference to be noted in the employment of the red or white varieties of wines so far as concerns gouty persons. Chablis, however, is preferable to Sauterne and contains less sugar. The best qualities of champagne, ten years old and not too dry, suit many gouty patients very well, if taken occasionally, but the rule as to quantity must be rigidly observed. No mixing of wines at any meal is permissible. A little mature port wine is often well borne by gouty patients. I know of no special virtue in what is called tawny port wine, sometimes vaunted as "safe" for such persons. Many gouty patients are, however, quite

intolerant of the smallest quantities of most of the wines just mentioned. We find, then, no rule in respect of the prescription of wine for the gouty. There can be no such rule. Sir Thomas Watson's advice to any young person showing signs of gout was excellent. He urged such to abstain from wine altogether.

It is to be noted that water-drinkers are apt to be large eaters, and they therefore undo the good effects of their abstention from wine. They generally drink too much water with their meals. Extra water is certainly advisable in most cases, but is best taken early or late in the day or between meals. Hard waters, impregnated with lime, or containing an undue amount of iron, are harmful for persons predisposed to gout. Many gouty patients take lithia-, potass-, or Vichy water at their meals. I believe all of these medicaments are harmful if regarded as articles of diet and constantly taken. It is not becoming to take medicines at meal-times. These waters are apt to prove depressing, and should only be employed temporarily as prescribed.

I suppose the great majority of British gouty patients take, or are urged to take, whisky in place of all other forms of alcoholic beverages. There is no reason why brandy and gin should not also be used. The difficulty is to secure a pure grape-spirit at a reasonable price. The quantity in any case must be small, and should never exceed two ounces, well diluted, and taken only with one meal in the day.

The question of appropriate diet for the gouty patient is therefore a matter of as careful consideration as is the prescription of any particular treatment by drugs. The patient before all, his family history, his upbringing, his habit of body, his environment, his daily habits, his age, his textural qualities and condition—all these points, personal and individual, have to be regarded and pondered in laying down rules (which in the first instance must always be experimental) for diet. So when we are told that this or that is good or bad for gout, we know that our informer is ignorant of the very alphabet of the matter. We have, in truth, many articles to select from, but the keynote of our prescription should be strict moderation in all or any one of them. I subjoin some remarks made by men very competent to judge, which will sum up for me the substance of the views I have here endeavoured to express. "No

second helpings" (Prof. Humphry). "Beware of luncheons; they spoil the frock-coat figure!" (Sir John Banks). "Give your gouty patients a little wine" (Dr. H. G. Sutton). "I am so far from desiring you to abstain from animal food, that I absolutely wish you to eat it freely every day. I am not afraid of your indulging the cravings of your appetite, provided that it be not stimulated by heating condiments or strong liquors, and that it be not excited by that elegant but useless variety, with which modern luxury has covered the tables of the rich. Neither am I afraid of your drinking one or two glasses of wine *after dinner*, though I do not wish you to make a rule of that sort, and it is clearly better to abstain altogether than by taking a little to endanger the taking much. Eat freely of animal food at dinner, but confine yourself to one dish. Avoid all high seasonings of every kind. Be cautious in the use of butter, oil, or vegetable acids. . . . Where the gout has continued long, the life is far advanced, the strength much impaired, the doctrine of abstemiousness is to be applied with great caution; and if the frame be much emaciated, it is not to be applied at all. In such circumstances a cordial regimen is the most safe, especially if it corresponds with long-established habits, because it is now too late to aim at abating the violence of the disease, and the object is to keep up the strength under it. Abstemiousness might suddenly lower this, and bring on complaints for which the gout would be ill exchanged" (*Advice to a Gouty Patient*. By Dr. Carrié, of Liverpool. 1790.).

"A slight excess of any kind, whether in diet or exercise, will excite the disease in those predisposed to it. When the train is laid an additional glass of claret may have acted as the match, but in all such cases the explosion would have equally taken place had, instead of claret, some other exciting cause fired it"—(Dr. Paris, 1837).

## REFERENCE.

*Trans. XIII Internat. Med. Congress., Paris, 1900, &c.*





THE TREATMENT OF URIC ACID.<sup>1</sup>

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Is the generally accepted treatment of uric acid satisfactory ?

It might almost seem that some apology is needed for introducing such a time-worn subject to the readers of *THE PRACTITIONER*, more particularly because I have nothing new to say, and what I shall say I have in a measure said before. But it is always well, I think, to keep on criticising commonly accepted opinions ; and if there be any one such in the practice of medicine that needs this because of the fixed hold it has obtained upon us, it is surely that uric acid in excess in the urine is the result of an improper diet. And absolutely so, in that if the man who passes uric acid can only substitute a diet that is free from materials that produce it, it can no longer be formed within him ; there will no longer be any such output ; he will be freed from his leprosy, and henceforward, if he abides by the prescribed regime, all will go well with him. Is this so ?

In attempting to answer this question there arises at once this difficulty : there is hardly any ailment, at any rate any smaller ailment, that flesh is heir to, that is not attributed by some to uric acid in excess. This may or may not be true, but if it is true, I can only deal with my question from a much more limited clinical aspect. There are many people who pass uric acid in their urine (gravel or cayenne pepper, as it is appropriately called), and with this they associate certain symptoms, and to get rid of the gravel they undergo a certain routine treatment. What is this treatment, and is it true that it accomplishes what it professes ?

In considering this question from the point of view of the practitioner, I shall not touch upon the chemical side of the subject. This may well be left to others more competent to deal with it. My purpose is to state the experience of clinical medicine so far as it has seemed to me to work out, because the result of the two lines of investigation, up to date, do not seem

<sup>1</sup> *THE PRACTITIONER*, January 1906.



to me to square. I have, of course, no thought of attempting to set laboratory research and clinical medicine by the ears, but I have always contended that clinical observation is, or may be, "original" enough to rank by its own merits; that it has the right to take its own position, and to say to the worker in the laboratory, "These are the facts, how do you explain them?" Rightly regarded, clinical observation is the pioneer of all research; a hundred times a day it will give a man far-reaching glimpses into the future, if he can only keep his eye clear to see, and his brain fresh and keen to think. The passage of uric acid in excess, or the conditions which it is supposed to represent, is emphatically one of those ever-present and intensely interesting medical problems which broad-minded clinical observation should do much to solve, and which are therefore exceptionally well fitted for ventilation in the pages of *THE PRACTITIONER*.

Now, what has the experienced practitioner to say upon this visible crystalline output—that is the point of my remarks. I am not going to dogmatise on the matter, or attempt to force my opinions upon anyone. My mood is rather that of a soliloquy, a murmur upon paper, as to where I find myself, after all these years of seeing and dealing with uric acid in being. But I will add that what I say hundreds of others, I am certain, must have thought. I do not want to know the opinion of anyone who has gone on the lines of accepting what our fathers have told us, and, acting upon them without adequate reflection, has gradually come to believe in what he practises. That is the frame of mind responsible for too many of the fads and frailties of medical practice. I want to know what the personal observation and thought of the reader has taught him. Is it belief? Or is it the "well-we-must-do-something-and-cut-and-dried-rules-have-an-advantage" attitude? Or is it an attitude of honest doubt? I come in with the last. The presence of uric acid in the urine seems to me an absolute puzzle. To watch the moods of uric acid is to convince one that the question is a vital one, meaning by that just what  $x$  in an algebraical formula would mean. But within this circle, bounded by the unknown, this much at any rate may be said—that in the complex working of the human organism there is an amount of subtle accommodation always taking

place between one organ or tissue and another ; some bankrupt always needing help ; some good-natural member ready to oblige a friend, of which chemistry as yet can take no account. For instance, years ago clinical medicine taught anyone with an observant eye that you may absolutely exclude the entry of all sugar-forming material into the body, and yet that the wonderfully complicated series of kilns within our bodies will contrive to manufacture sugar, and turn it out in the urine in quantity. The physiological chemistry of that day never taught that, and the treatment of glycosuria of that day devoted itself exclusively to keeping sugar out of the diet. It is surely quite in recent years that this  $x$ , still more or less of an enigma, of diabetes has been taught as a fact. It is exactly the same now with uric acid, for there can be no doubt that the all-prevailing teaching at the present day is that uric acid comes exclusively from certain proteid foods, and that if only we do not put these into the body, we shall get no uric acid out. It is diet, diet, diet, for a man who passes uric acid. It is "get the acid out of your system" and all will be well. I cannot see that clinical medicine teaches this in anything like the unqualified way in which the doctrine is inculcated upon those who earnestly believe in its truth, or upon unfortunate patients. Chemistry may seem to teach it, but, if so, so much the worse for our knowledge of chemistry. We must look closer into the matter until we see that it has not yet come to the end of discovery in this quarter, and that its synthetic side, as seen in the human body, has marvellous ways of evading direct observation and of bringing to naught any reasoned deductions.

Clinical observation certainly teaches that in many cases you may diet, and absolutely exclude all uric acid forming food of whatever kind you assume that food to be, you may wither up your patient into a shrivelled, juiceless, prematurely aged being, and there will yet, by some means or other, under favouring conditions, be squeezed out of his tissues enough uric acid to form a large deposit of red crystalline matter in his urine. There is still a very large  $x$  outside diet to be grappled with and explained by physiological chemistry.

I have set many a person to work at investigating the cause of this evidence of "acidity." I have asked many a

doctor thus affected if he could tell what caused it, and: I have generally been met with the reply that it was as yet beyond his ken. I have, of course, met many who have found salvation in diet (many also, by the way, who by the same method have found the opposite), but in most of them, when carefully questioned, I think their so-called cure has been, like the cure of asthma by nasal operation, a relief from gross discomfort, but a more or less frequent relapse into minor discomforts that linger longer, and indeed may almost be said to form part of the round of daily life, and this too by the reduction of the body to a state of semi-starvation.

For instance, here is a recent case of a man somewhat enthusiastic in the casting out of his system the devil that possesses it. He is clever, well educated, and works hard with his brain. His breakfast is a cup of coffee, a bit of toast and butter; lunch is a roll and butter and coffee again; dinner, a small amount of fish or meat—very little, as he dislikes meat; vegetables of one or two sorts, a milk pudding and fruit. I do not say that this is what an expert in uric acid would advise, but it is what a layman arrives at, after having received advice from an expert, and it is undoubtedly born of advice, very prevalent in these days, that shies more or less at all proteids, and especially at those that are derived from animal food. The result is that a large excess of carbohydrate is taken, and the man too often rushes into the arms of the condition he is trying so anxiously and carefully to avoid. These strivers after freedom from their *bête noire* nearly always land themselves in a number of small discomforts where their ideal of bliss is just out of reach, yet, as they think, well in sight, and ever more and more something fresh is eliminated from the diet as the thing that keeps the ship out of port, with the result, as in the case to which I have referred. It wants no doctor to see that the man is starved!

I am not concerned to deny that diet has a share in the production of disease by the formation of unnatural products, or of natural products in such excess as to produce disease. It is my purpose to insist that "acidity" is brought about in several ways, at any rate that it does not attach itself exclusively to any one class of food, but if anyone is to be banned on this account, my observation would lead me to look to the carbohydrate group, and not to the flesh foods. But diet is after all not the



initial fault in many, perhaps not in most, cases. Glycosuria may be produced by the ingestion of too much sugar, and I do not doubt that an uric acid output may be the direct outcome of too much food of one kind or another, but take them all round, I should say that the subjects that *complain* of acidity (there are those who though passing it in excess do not complain of it and are, so far as they know, in perfect health) are obviously deficient in something that in others makes for health.

Sitting one day on a motor-car, when the machine would not run smoothly, and the driver could not find the cause, he said to me, "Motors are like men"—I am not sure he did not say women—"they have their good and bad days and their tempers. Some days they will not go, and on others do a long non-stop run without the suspicion of a hitch." What is that condition in man? To answer that question one would need to answer this: Why do your corns shoot in changeable weather? as well as many another, equally out of range as yet of any exact science. What is there in individuality? It surely cannot be maintained that it is only uric acid! On the contrary, uric acid depends upon it. With every probability of truth, it may be said that the cause of uric acid production in excess, like the production of sugar phosphates and other abnormalities, is due to a defective driving force, which leads to an imperfect metabolism of natural and wholesome foods, and what is needed to restore the balance is less the change of food than the steam or nervous energy that drives the machine, and the oil that enables its mandates to be properly conveyed.

My experience of uric acid passers is that there are two groups. One comprises those who are apparently quite well; have no complaints to make; who take all things cheerily; and who notice the presence of sand, as it were, by accident: the other a much larger group, who in association with the passage of sand, are generally miserable; they are nervous and apprehensive about themselves; they pay attention to every ache and pain; they have frequent headaches, chest aches, abdominal aches, rheumatism here, and gout there; they are well posted in all their excretions, both as to quality and quantity; and, in short, there is



not an organ, or tissue, in the body that does not let these unfortunate people know that it exists. Such are subject to fits of depression, that come on without rhyme or reason; they may be sleepless; they frequently suffer from the malady known as mucous colitis, and are generally ardent advocates of some particular diet, to which they adhere with an ever-increasing rigidity and faith. Some of them are less steadfast, and, finding one plan fail them, try another; but it is all the same, they still pass uric acid, they are still "so acid," or "full of acid," as they express it, and they are ever in pursuit of a new and perfect food. If they were close observers enough they would notice that the uric acid appears and disappears absolutely without any correspondence with the particular food that has been taken. In some cases there almost seems to be a sort of periodicity about its coming and going: its coming being associated with all sorts of nervous dreads; its going equally with such a sense of well-being and happiness, as to fill them with a sense of forgetfulness of the past, and a temporary disbelief in any recurrence of their woes; a disbelief, alas! often destined to be but short-lived.

Uric acid, in its coming and going, is quite like gout and the paroxysmal neuroses, and undoubtedly lends itself very readily to the hypothesis of some nervous origin in a want of control, and some perverted metabolism of such causation. And it is obvious that the very existence of such vagaries is enough to render any opinion as to its cause but tentative.

But as regards particular food, red meat seems to be held in most abhorrence, as productive of acidity, so often is one told when there is any suspicion of goutiness, that the patient must not take any butcher's meat, but live on white fish and chicken, and not much of those. But, try as hard as I can to see with other people's eyes, I cannot detect this predominant evil influence of meat in causing the appearance of uric acid in the urine.

On the other hand, I do think that, perhaps, rich gravies, sauces, spices, and pepper *may* have an adverse influence. They are clearly articles likely to disturb a weak digestion. I doubt if plainly cooked meat of any kind is other than readily digested, if well masticated, and much better than many things usually held in higher estimation. There are, of course, many

people who will tell you that they are better without meat ; with meat they have headaches, and this, that, and the other discomfort, from which they rightly consider they ought to be free ; and that living upon a vegetable diet, for example, is much healthier for them. I do not dispute it for a moment. I invariably say : "If you have a diet that agrees with you, by all means keep to it." But the vegetarian, or milk-feeder, or the eulogiser of the last new food, is not content with this, he holds that such an admission gives the case away for meat, and straightway wages war against all the rest of the world because it does not follow his example. In so far as this crusade tends towards simplicity of diet, I do not doubt that it is of great value, for although I do not think there can be the least doubt that a due proportion of meat in the diet is the most appropriate one for the great majority of mankind, I am equally convinced, as I have just now said, that the trimmings, in the way of sauces, and the many different things that are put into the stomach at each separate meal, are the details to which one may take exception. We all know there are those in considerable numbers at the present day, who, by advice or their own insight, live largely on meat and water. I am not expressing an opinion now on the value of this diet ; but, at any rate, it may be said that it does not lead to an excess of uric acid in the system, as ought to be the case if we are to accept the statements of those extreme doctrinaires, who rule all meat out of their category of diets. It is, indeed, well known that those who live thus have mostly done so to rid themselves of ailments that another school ascribes to this same excess of uric acid.

So much *for* meat diet ; so much *against* the rich or mixed living that too often accompanies it, but which ought to be dissociated from it, if we are rightly to judge of the ill effects of red meat itself.

But now for other foodstuffs : and, if I am sure of anything, I am sure of this, that a food that too largely consists of bread and starchy material of all kinds leads to gravel in no small number of cases. I made this statement years ago, as regards children who pass sand, that, while nearly in all cases they were taken off red meat because of it, the excess of starchy food really needed limiting, and I do not doubt that

from Dr. Eustace Smith, I learned my first lesson in this respect, although even in those days I was wont to contend that a neurotic working of the machine lay behind, and in some way determined the fault of digestion.

I think it was Dr. Latham who, some years ago, worked out an indictment on chemical grounds against fats and sugars. I am not sure about sugar in moderation—indeed, I think that in strict moderation it is a good article of food at all ages ; but as regards fats and cream, I am inclined to agree, and I think some fats are more harmful than others. It seems likely that, of all fats, bacon fat and pork fat are the most easily digested.

Cream, I suspect, has its limitations. In strict moderation it is seldom hurtful, for there is very little in the common objection that it makes one bilious. Those who avoid it are commonly “bilious” because all their organs are starved. But without doubt in babies one may almost say that fat (cream) is a more important food than albumen, and even so, also at full age, in various gastric disorders ; after middle age, cream taken in any excess may associate itself in some with the output of uric acid.

I think, therefore, that those who are inclined to the passage of uric acid should be careful as to the consumption of unadulterated starch, and sugar, and fat, including cream ; but I also think that all these things are probably digested better early in the day than late, and by themselves than when five or six different forms of foods are put into the stomach at once. I never advise anyone to exclude them absolutely, as is much too often done.

Salt is another article of diet that, if consumed with any freedom, as is not uncommonly the case, is not above suspicion. I do not doubt, of course, that it is a necessary and wholesome article in moderation, but, in those prone to form uric acid in quantity, it may be prejudicial, and there are numerous observations scattered throughout medical publications that seem to point to this conclusion. Of some of the acid fruits I think the same. Some people will consume lemons in such a quantity as would imply that, in any number, they are quite harmless because “they are good for rheumatism”—which is often gout. But lemon juice is by no means the neutral article that is supposed. It will often



upset the gastric, or intestinal, digestion in a very decided manner, and so also will currants and strawberries and plums. The late Dr. Milner Fothergill, recognising the harmfulness of some fruits in some persons, recommended that, in making fruit tarts of the acid fruits, a drachm of bicarbonate of potash should be cooked with each pound of fruit, and this system has been endorsed by others ; but it does not sound so appetising as to induce one to follow it, more particularly as it does not appear certain that those who have spoken of its value have ever tasted such dishes themselves. Vinegar is one more article that I will just mention, as it is probable that it is, either in itself, or in its influence on other things, or in association with other things, indigestible if taken in anything more than a mere flavouring quantity.

Wine shall be my last item on the list, and of it I have to say that it has appeared to me to be much more prone to call out erratic tendencies on the part of the digestive processes than food of any kind ever does. And I find myself in complete accord with those who think that the great majority of men, and still more of women, are, in the present state of their environment, much better without it. I have no sympathy with those who would forbid anyone an occasional glass, for I cannot bring myself to think so meanly of the human kiln as to believe that it has not more power of accommodation than this implies. The daily habit is all important ; but if a glass of wine is taken—say, at an occasional dinner—it matters not what be the kind of wine, no real harm is likely to follow, on the understanding that a glass means a glass, and not half a bottle. I do not doubt, too, that it is true that some do require a small quantity of alcohol as part of their daily food, and what form this should take must be determined much by the patient's own observation, as to what suits him best. No doctor can do more than make a rough guess. But, as a general rule, the lighter the wine the better, and even then it is a good rule not to take it year in and year out, it is much better to do without any some days, when work is less, appetite greater, and so on. I am afraid I am somewhat heretical as regards wines, but this I know, as has often been said before, that there is many a gouty man who does well on a glass of port after



his dinner ; many another who takes his two glasses of champagne daily, and seems the better for it ; and I have still personal leanings in favour of the wholesomeness of a glass of good old sherry in cases where a little wine seems a judicious prescription. I am as much as ever an opponent of the prevalent dictum, " You must not touch wine, you must drink whisky," which too often means to the patient, " A glass of good wine is poison, I may take as much whisky as I like, and it is harmless"--one of the most mistaken and mischievous beliefs that ever plagued a world.

Let me now say a word or two upon conditions, other than dietetic ones, that circumstances have led me to think have an occasional bearing upon the formation of uric acid in excess, although I will say again, it is difficult, indeed, to say which is the cart and which the horse. And, first, as regards starvation, I have come to think that there are some in whom, if the proper amount of nutriment required by the constitution is denied, the digestion will become so perverted, that the proper derivatives will cease to be formed, and uric acid, and other products that are not ordinary, will come in their place. And, for some confirmation of this, let me call to mind the well-known fact that many a careworn, harassed man, really ill with gout, has temporarily dispelled all his troubles by sitting down to, and eating a thoroughly good dinner in cheerful companionship. Clearly, one explanation of this may be that the abundant supplies taken in have so stimulated the system, that the proper products are again formed, and the uric acid has vanished from that moment. Take the case, again, of a man, who has been passing uric acid for months, who has not been well all the time, and who has dieted himself in every conceivable way that he can think of at all likely to rid him of his plague, and with no success. Suddenly, perhaps, he feels a little better ; certainly he becomes sick of all his precautions ; he begins to eat anything and everything ; his troubles disappear within 24 hours, and perhaps may not return for many months ; not, indeed, till he again is becoming a little stale, and is wanting a holiday.

The man, who does not look at everything from a contracted dietetic standpoint can tell of many such cases,

and I cannot but think that diet, and diet alone, has been ridden to death for this class of ailments, and to the detriment of the elucidation of the true nature of the disease, if it be one.

And involved in this question of the effect of diet is the question whether certain things are harmful in themselves, as directly providing the pabulum for the production of uric acid, or whether they are more of the nature, say, of ferments, if such a term may explain my meaning; that is, bodies introduced into the system that set going processes in other elements, unlock certain compounds, which in the end lead to the output of the particular ash. And the reason for making the suggestion lies in what I have said: that it would appear as if certain foods are at one time harmful, and at another quite the reverse. I think this especially, perhaps, applies to fruit, starch, and wine.

Next, I may say a word upon constipation as frequently associated with the output of uric acid. I believe Dr. Bezly Thorne has especially insisted upon this point, and, if so, I think he is right. At any rate, I have observed that, in some cases, the output has corresponded with the existence of constipation, and I have also observed, as already mentioned, that it is likely to be associated with that condition of the colon—catarrh, or what not—that we are in the habit of calling by the name of mucous colitis. I cannot deal with this complaint here, but I may say this of it, that it is an exceedingly common complaint, and that I believe no one can study it without coming to the conclusion that it is more of the nature of an abdominal neurosis than it is of any real disease of the mucous membrane of the bowel. And in the association of urinary gravel with mucous colitis, one may perhaps obtain new light upon the subject of uric acid, for the suggestion is patent that in a large number of cases the formation of uric acid is first of all a nervous aberration, by which all the natural digestive processes are upset, and the uric acid is the result of the imperfect combustion. This accords with many facts in its history; it accords with its peculiarly erratic coming and going—a coming and going that, as I have said, baffles explanation. It is in accord with another fact, that it sometimes seems to play peep-bo with sugar and albumen and oxalates and phosphates. One hour you may find one of

these products, at another there may be present any one of the others named ; also, with the facts mentioned, that it is often associated with considerable nervous depression, and that a good dinner may alter the whole tenor of months of ill-health as it were in a moment. Indeed, the only fact with which it does not seem at first sight to fit is that uric acid is often passed in health, when there are no symptoms of illness or discomfort of any kind. But this is equally a difficulty for those who would put all those who pass uric acid under a rigid system of diet, for these people are not ill. But there is a ready explanation of such cases in this, that it is not necessary to insist that the abnormal excretion of uric acid proceeds always along the same lines. If uric acid is indeed the active poison it is said to be, then it ought never to be present without some of the symptoms attaching to the poisoned system. If, on the other hand, there is a rich man's uric acid and a poor man's, to adopt the terms that are well known for gout, then one can understand that in the well-to-do (in health), it is merely an excess of steam that is being let off ; that it represents an amount of intake that has not been properly utilised ; and that it causes no symptoms in consequence. If, on the other hand, the overworked, the worried, the anxious, takes to passing uric acid—the poor man in the widest sense of the word—then he is making uric acid out of his very life's blood, so to speak, and one can understand how the presence of waste of any kind is then associated with so many symptoms, and such evident signs, of deterioration of health.

There must be many, one would suppose, who, at certain moments of their life, whether they have been times of great anxiety, or shock, or excitement, have had the knowledge or sensation that their juices had been turned to gall and bitterness. Such a thing is surely possible, indeed, one may say likely. Some sudden momentary inhibition of the energy of the great abdominal sympathetic, for example, arrests the natural processes of all the viscera under its control, and the excretory output is changed into uric acid in one case ; into sugar in another ; into phosphates in another ; and so on. It is not necessary to labour the fact ; in some sort or other it is so certain.

And here I may properly meet an objection that will



certainly be raised. It is very commonly supposed that when at the various spas that are credited with washing out uric acid from the system a quantity of sand is passed in the urine, herein is the proof of the efficacy of the water. But, of course, this is not so, or at any rate this is a very bald presentation of the facts. I have asserted elsewhere as an opinion, that the uric acid passed in such quantities at Con-trexéville, and other kindred spas, is, much of it, manufactured on the premises. And I do not doubt that this is true. People do not go out there gravel mines, and come back worked out. They go out ill with certain symptoms that are attributed to a gravel mine, and they come back in many respects very much better, but there are many other possibilities than the one of washed-out uric acid. They go out with a jaded nervous system, with a disturbed digestion, with a disordered liver, and an impure blood, the result of all the organs being for the time played out. The immediate effect of the waters is to make many of them worse, and even for the whole time they are there, some may feel but little benefit, so that the bath doctor is always ready with the common sedative, the benefit will come by-and-by (which is true), coupled with "You must come again next year," which, bias notwithstanding, is also, I daresay, good advice.

Who knows how long it has taken to form the cayenne pepper-like deposit that appears in the urine, say, on any particular morning? No one perhaps can say precisely, but anyone who passes it can give a pretty good guess, based upon the erratic nature of its appearance and his associated sensations. From what I have been able to elicit in such cases, I believe, that 48 hours or even less is in all probability sufficient for the formation of crystalline masses large enough to be almost called minute calculi.

The coming and going of sand in this way is, I believe, incompatible with the supposition that its substance has been lying *dormant*, perhaps, I may say, waiting to be flushed out upon the exhibition of a large quantity of water. It would appear, on the contrary, that uric acid must form rapidly, and at the bidding of an intermittent energy, the ebb and flow of which the patient can recognise as such, low down in the springs of his being, for he can oftentimes forecast the result



with certainty many hours before the actual appearance of any crystalline deposit, and if so, it is much more reasonable to suppose that the patient goes to the bath ill from a concatenation of unhealthy products, not uric acid, but some thing or many things that will or may go to form that ash in the efforts of nature to purify its own machinery. The output of uric acid is always an effort to right the machine, but it is the result of an incomplete synthesis. A man at home may be so deranged that he cannot even get so far in the attempt to better himself as is seen in even uric acid, and when he arrives at "the cure," he is soon stimulated into this partial restoration, and uric acid appears, but, mind, all formed on the premises. After a time he is still better, and the uric acid all vanishes. Why? Certainly not because it has all been washed away, but because the level of health has reached that height that the kilns are all again in full work, and the soot is no longer thrown down. Surely this is the explanation why some people pass uric acid and have no symptoms—they turn out a certain amount of ash of this description simply because they are giving their organs too much to do; it is a surplusage of work begun but not completed, but it is no evidence of failing power on the part of the viscera—quite the contrary, the organs have been putting in extra time. This, too, explains how a man should often and often, after feeling depressed and out of sorts, be able to foretell its coming, as I have said he can; it explains how a man thus passing it is instantly restored to health by having a good stimulating meal, and it also indicates what I believe to be true—that the worst of all treatments for many of the symptoms of what is supposed to be lithæmia may be a diet so rigid as to keep the patient always thinking about himself.

Perhaps someone will now say, "What then is your own treatment for these uric acid troubles?" Well! I have not got one. I can give plenty of good advice though, and advice is heads, and "treatment" tails! Well-considered advice is here the one thing needful. In such cases as I have in mind the doctor stands to the patient as a man with some knowledge of hypsiology, and who, looking at him, tries to penetrate the inner workings of all the man's organs, mind, and body, under the complex conditions of his daily life—his environment. It

is not man in general whose unravelling is attempted, it is this one individual, all important to himself and his clan. Your past experience is nothing to him, except as it enables you to solve the secrets, the quips and cranks, of his particular machine, and to advise according to that insight, as to its smooth running. All doctors can be, and must be physiological experts by thought, although they cannot be by sight or by the teachings of actual experiment. And what does this mean? Surely this, that in one case your advice will carry a glass of port wine at eleven a.m., or, as a late celebrated physician used to say, its equivalent, if there is one, of which I am not quite sure. Very injudicious advice to commence with, some will say. The late Dean Vaughan is said to have advised those who read with him always to make a point upon the first page of a sermon. Humbler men may well be content if they are able to make one even on their last, and this is a point, if it amounts to no more than the aphorism—that drinking between meals is dangerous. To the next man our physiologist may perhaps find it necessary to say, “Cut off your telephone, and avoid the financial columns of your morning paper;” to another case it may be, “Leave your husband and children.” Yes, women are sufferers as well as men, and I am only suggesting a temporary estrangement. In others it is, “You want a holiday; get more pleasure into your life if you can.” “Do less work, and have more play;” or, “Your responsibilities are too many, the excitements of your life too great.” It may be that monotony is the bane, and a hobby the remedy. *With* all these, or beside them, there is the “Eat less,” or it may even be, as I have said, “Eat more.” “Drink less;” I will not say drink more, lest I be misjudged, but doctors must always try to hold the balance true, and I recall from the interesting biography of the late Sir James Paget by his son, Mr. Stephen Paget, that that distinguished man would often praise God for good food *and wine*. But let the physiologist continue:—“Study for yourself the way—and not so very narrow a way either—of physiological righteousness; eat less meat, or may it even be none; eat less of the rich things of the table, the unconsidered trifles that are the outcome of latter-day social society”; and so on. This for one man, that for another, but strict moderation in all things,

mind and body, is the rule of life for avoiding uric acid and allied troubles.

I have said nothing about drugs, except port wine, but I will now say this—that all the uric acid solvents, so much vaunted, appear to be equally useless for that special purpose ; but I believe that salines have their value, if given with discrimination, for facilitating the excreting power of the several abdominal glands. And in this way water is probably one of the best remedies, but even water drinking, if excessive, is, I think, not to be indulged in with impunity, for I am by no means prepared to assent to what appears to be the popular belief that water being harmless, it matters not what amount is imbibed in the 24 hours.

In my opinion, the late Sir William Roberts's simple prescription of half a drachm of bicarbonate of potash in a tumbler of water at bedtime, to stem the nightly acid tide, is, on the whole, one of the most useful recommendations, apart from tonics, cures at watering places, and change of scene and air.



## THE TREATMENT OF GOUT IN ITS VARIOUS FORMS.

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GOUT is probably produced originally by an altered gastro-intestinal secretion, which in its turn leads to an alteration of the toxins produced by one of the intestinal bacilli. A catarrhal condition of the intestinal mucosa is probably responsible for the change in the intestinal secretion, and this catarrhal condition may be either an inherited trait, or induced by errors in diet. This change in the intestinal secretion would produce a change in intestinal toxins until a point would be reached when an excess of food or alcohol would generate a sufficient amount of toxin to produce an attack of gout; this tendency would increase unless kept in check by careful dieting, and subsequent attacks would be more easily produced; also this tendency would be transmitted to the offspring, and those starting life with it would tend to have gout earlier, and in an aggravated form.

The view as to the bacterial origin of gout is supported by the well-known fact that adequate removal of the intestinal contents at the commencement of the gouty attack always effects rapid diminution of the symptoms. Moreover, the classic remedies for gout have only two things in common; one that they relieve gout, and the other that they check intestinal putrefaction, or diminish the absorption of its products, or promote their elimination from the system.

It must be remembered that there are two drugs which from their great influence in gout must always be taken into consideration when thinking of the origin of this disease—the action of colchicum in relieving and that of lead in inducing gout. It is suggestive that both have an action on the intestinal secretion; colchicum causes an immediate alteration in its amount and character; lead has the opposite effect of causing a diminution and alteration of the intestinal secretion when taken in small and long-continued doses.



As regards the treatment of gout, in the first place it should be borne in mind that no routine treatment can be adopted which is suitable in all cases. The nutritional condition of the patient, his habits, surroundings, and mode of life, constitute factors that must necessarily modify the treatment of individual cases, and with gout, as with so many other diseases, it will be found that each individual case requires separate study and frequently special treatment. Quite apart from the treatment of an attack of gout, which is a comparatively simple and easy matter, the treatment of the condition or conditions which led up to the attack must be considered. In connection with this point it must be remembered that the gouty individual is one whose general metabolism is unstable, and that this instability may be present in one or more of the great physiological systems—the digestive, the nervous, the circulatory, etc. The question which of these systems is primarily and mainly at fault should always be a matter for patient investigation, and one must then endeavour to improve the metabolism of that system by suitable medicinal, dietetic, and hygienic treatment.

The treatment of gout should have for its aim the following objects :—(1) The treatment of the gouty paroxysm in cases of acute gout, and the relief of the pain as speedily as possible ; (2) the treatment of the subacute or chronic condition and the prevention of the recurrence of an attack ; (3) the treatment of the affected joint or joints with the object of removing the uratic deposits, and of preventing permanent deformity ; and (4) the treatment of the various forms of irregular or abarticular gout.

In all cases of gout a very careful examination of the urine should be made. The indications that the kidneys are not performing their proper functions are the existence of a certain amount of polyuria ; a low specific gravity of the urine—usually from 1,007 to 1,016 ; the presence of a small quantity of albumin, which, however, may disappear for some time and then reappear ; the presence of a few granular casts, if a careful microscopical examination is made after centrifugalising the urine ; and a diminished daily excretion of uric acid and generally of urea. It is most important carefully to examine the urine for traces of albumin, and for the presence of casts. For the latter purpose the centrifugal machine should be used,

as the casts, when present, usually occur in but small numbers, and are otherwise very slow to settle.

#### THE TREATMENT OF ACUTE GOUT.

In order to arrest the abnormal intestinal fermentation, to remove the excessive numbers of intestinal bacteria, and to relieve the catarrh of the intestinal mucosa—all factors in the development of abnormal intestinal toxins—the bowels should be freely opened with four grains of calomel or “blue pill,” followed by a saline aperient. For the first 24 hours it is preferable that no food should be taken, but water should be drunk freely.

For the treatment of the gouty paroxysm the limb should be placed in the horizontal position, or slightly elevated above the level of the body, and a cradle should be arranged so as to keep the weight of the bedclothes off the affected part. To alleviate the severe pain felt in the affected joint warm packs should be arranged round it, consisting of cotton-wool saturated with a soothing lotion, and then lightly covered with oil-silk. I have found the following lotion most useful in relieving the local pain:—

|                   |   |   |   |   |           |
|-------------------|---|---|---|---|-----------|
| Sodii. Carb.      | - | - | - | - | ℥iii.     |
| Linim. Belladonnæ | - | - | - | - | ℥ii.      |
| Tinct. Opii       | - | - | - | - | ℥ii.      |
| Aq. -             | - | - | - | - | ad ℥viij. |

A small portion of the lotion should be mixed with an equal quantity of hot water, and then poured on cotton-wool previously arranged round the joint. The pack should be changed every four hours. In connection with the acute paroxysm no attempt at local depletion—such as the application of leeches to the inflamed joint, blistering, or incisions—should on any account be made, owing to the great liability of thereby extending the inflammatory condition, and so producing subsequent ankylosis or deformity.

For the internal treatment of acute gout, colchicum is one of the most valuable drugs that we possess. It should be especially used for acute gout, and for subacute attacks supervening on chronic gout. If it be used continuously, tolerance is apt to be acquired, and then the drug ceases to act. At the com-

mencement a large dose of from thirty to forty minims of colchicum wine should be given, followed by a mixture containing in each dose from ten to twenty minims of the wine with from forty to sixty grains of citrate of potassium, which should be administered three times a day. The citrate of potassium, which is given for its combined properties of acting as a diuretic and of diminishing the acidity of the urine, may, if desired, be given as an effervescing mixture, using thirty grains of potassium bicarbonate to twenty grains of citric acid. Colchicum reduces the gouty inflammation, relieves the pain, and shortens the attack. It should only be taken under medical advice, and should never be given in such doses as to produce extreme depression; after the inflammation of an acute attack has subsided the doses of colchicum should be gradually diminished until it is left off.

A very useful method of administering colchicum is in the form of its active principle, colchicine, which may be given in doses of from one-fiftieth to one-eightieth of a grain three or four times a day immediately after food. Only a few patients will tolerate doses of one-fiftieth of a grain, the contra-indication of such a dose being the production of diarrhoea and intestinal griping. The following constitutes a very useful pill:—

|                 |   |   |   |   |                      |
|-----------------|---|---|---|---|----------------------|
| Colchicinae     | - | - | - | - | gr. $\frac{1}{10}$ . |
| Ext. Nucis Vom. | - | - | - | - | gr. $\frac{1}{4}$ .  |
| Ext. Hyoscyami  | - | - | - | - | gr. $\frac{1}{2}$ .  |
| Ext. Gentianæ   | - | - | - | - | gr. j.               |

After the initial free purgation, as previously mentioned, it is not desirable to produce too free an action of the bowels. All that is necessary is to have a sufficient action to relieve portal congestion and intestinal catarrh. The following pill effects this purpose, in most cases, very well. It is administered at night, and is followed up, when necessary, by a dose of saline in the morning.

|                    |   |   |   |   |         |
|--------------------|---|---|---|---|---------|
| Leptandrin         | - | - | - | - | gr. j.  |
| Iridin             | - | - | - | - | gr. j.  |
| Ext. Hyoscyami     | - | - | - | - | gr. j.  |
| Ext. Colocynth Co. | - | - | - | - | gr. ij. |

If the pain of an acute attack of gout is so severe as to prevent sleep, seven grains of veronal, or ten grains of trional



may be given, or a full dose of extract of hyoscyamus will, in some cases, act as a very useful anodyne. The administration of opium or morphine should, if possible, be avoided owing to the risk of its deficient elimination, and also on account of its diminishing the amount of urine, and its tendency to derange digestion and to check hepatic metabolism.

#### DIET IN ACUTE GOUT.

As previously mentioned, it is preferable that no food be taken for the first twenty-four hours of an acute attack of gout, but water should be drunk freely. During the acute attack the patient should be restricted to a milk diet, which may consist of milk, bread and milk, and tea made with boiling milk instead of with water. Weak tea with cold toast thinly buttered may also be taken. The free drinking of hot or cold water, or of some simple mineral water, should be encouraged. The milk diet should be continued until the acute inflammation is subsiding, which stage is indicated by the lessening of the pain, and by the pitting on pressure of the affected parts. No alcohol in any form should be given during this stage, unless there are strong reasons for its administration, such as a weak action of the heart and a feeble, irregular pulse, when a little well-matured whisky diluted with Salutaris water will prove the best form of alcohol. Beef-tea and any of the meat extracts or essences should be avoided at all times by gouty patients, owing to the tendency they have to irritate the kidneys, and to the fact that they are loaded with waste nitrogenous products. With the subsidence of the acute attack the patient may return to a more liberal diet, but care should be taken to avoid anything indigestible.

#### TREATMENT OF SUBACUTE AND CHRONIC GOUT.

In addition to colchicum, which may be given in small doses, guaiacum may very usefully be administered as an alterative, which stimulates the metabolism of the liver, and also affords relief to the portal system. From five to ten grains of guaiacum resin should be given in cachets two or three times a day, according to the effect on the bowels, since guaiacum sometimes acts as a laxative. The method



of administering the powdered guaiacum resin in cachets is far preferable to giving the tincture of guaiacum in a mixture, as, in the latter form, a nauseous medicine is produced, and the precipitated resin tends to cling obstinately to the tongue and fauces. In cases of chronic gout, the colchicum may be very conveniently administered in the form of the colchicine pill, given three times a day. In order to encourage the elimination by the kidneys of the toxic agents of gout, citrate or bicarbonate of potassium should be employed as a diuretic, which increases the volume of the urine, and, at the same time, diminishes its acidity. The use of the potassium salt may with advantage be pushed until moderate alkalinity of the urine is produced, as, by such means, the tendency to the deposition of uric acid, or sodium biurate, in the kidney tissues is removed. Free diuresis should also be encouraged by the drinking of sufficient quantities of water. Of the beneficial effects of employing a potassium salt in conjunction with colchicum in the treatment of acute and subacute gout I am fully assured, and my experience is that of the various potassium salts the citrate is the most useful. If given in sufficiently large doses, it tends, by its conversion in the kidneys into the carbonate, to diminish the acidity of the urine, which is generally high in connexion with the gouty paroxysm, while, at the same time, it increases the solvent power of the urine for the uric-acid salts, and so assists their elimination. In cases of sluggish action of the liver, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, and of other forms of irregular gout, in which there are no appreciable uratic deposits in the joints, mineral waters containing sodium salts are undoubtedly beneficial, owing to the action of those salts as hepatic and gastro-intestinal stimulants.

As regards the use of lithium salts in the treatment of gout, my opinion is that they are not so useful as the potassium and sodium salts. The principal objection to their use is their greater toxicity, and depressing action on the heart, as compared with the potassium salts. They consequently have to be given in such small doses that I am very doubtful whether, in such doses, they possess any remedial effect at all. On the other hand, I constantly meet with patients suffering from cardiac depression, and even dilatation, as the

result of the excessive and continued consumption of lithia tablets, which are so persistently, so speciously, and so wrongly vaunted as curative of gout.

The enlargement and tenderness of the gouty joints is due to two causes, the deposition of sodium biurate in the cartilages and fibrous structures, and a chronic inflammatory thickening of the fibrous tissues. For the reduction of this thickening, as well as for painful gout of the sole of the foot, and for gouty neuralgic affections, iodide of potassium, given internally, is a useful remedy. In cases of gout associated with the contracted granular kidney, as evidenced by slight albuminuria and high arterial tension, the administration of iodide of potassium is also most beneficial. I usually prescribe it in doses of 10 grains three times a day, and continue its use over a period of six or eight weeks. My experience is that it seems to act more beneficially when given in combination with the compound decoction of sarsaparilla.

The indulgence in high living by gouty subjects induces arterial plethora and a rise of blood pressure. The consequent strain on the arterial walls produces arterial disease if continued long enough, but in the early stages of such rise in blood pressure the administration of "blue pill" and careful attention to diet will always prevent the incidence of arterial disease. Gouty subjects are more prone to the injurious effects of constipation of even a slight degree than are non-gouty individuals.

#### PREVENTIVE TREATMENT OF GOUT.

After convalescence, as much exercise as possible, short of fatigue and discomfort, should be taken in the open air. Cycling is an excellent exercise for the gouty, since it furnishes good muscular movement in the open air without the gouty joints having to bear the weight of the body.

I have now had a considerable experience of the prophylactic effects of guaiacum resin, and I must confess that I know of no drug which is more useful in the preventive treatment of gout. Its action is probably due to its stimulating effect on intestinal and hepatic metabolism. The form in which I prefer to give it is that of the powdered resin in cachets, commencing with doses of 5 grains three times a day after

meals, and gradually increasing the dose to one of 10 or 12 grains. In this form it can be taken without any discomfort to the patient, whereas if administered in the form of the tincture in a mixture a most nauseous medicine results.

To prevent, as far as possible, the recurrence of gout, the patient should also give careful attention to diet on the lines laid down under the heading of diet. Regular habits of life, with even and sufficient exercise, should be encouraged, and constipation should be zealously avoided.

Briefly stated, the individual who is subject to gout, and who wishes to prevent a recurrence of the disease, should lead an active and an abstemious life.

#### LOCAL TREATMENT OF GOUTY JOINTS.

If much swelling of a joint persists, the limb should be elevated as much as possible, and a light flannel bandage applied to the joint. If the œdema persists, the hot douche followed by sponging with a cold strong solution of common salt will be found serviceable. The application of the so-called solvents of uric acid externally to the affected joints is useless, as they are not solvents of sodium biurate. Careful massage and gentle exercise of the stiffened joints should be employed, but only when convalescence is fairly established; massage and muscular movements increase the flow of lymph in the lymph channels, and so tend to promote the removal of uratic deposits, and to increase general metabolism.

A free movement of the lymph in the lymph channels is essential to oxidation and metabolism, and therefore massage and muscular movements exercise an important influence on account of the pumping action produced in the lymph-spaces by both forms of exercise. Muscular movements and respiration are almost the only means by which the circulation is ordinarily carried on in this system, as it has no motor mechanism with the exception of the *vis-à-tergo* of the heart and arteries, and, if these latter are in default, delay and defective metabolism must result if muscular exercise is not taken. This is an argument, from the physiological side, in proof of the fact that a sedentary life and deficient exercise conduce to gout. Massage should never be resorted to in cases of acute gout, as it not only aggravates the disease at that stage, but also causes



severe pain ; it should be reserved for the more chronic cases. Massage produces an increase in the amount of blood and lymph passing through the tissues concerned at the time and afterwards. This improves the nutrition of the affected tissues, promotes absorption of deposits, and restores physiological activity. In subacute or chronic cases, where the joints remain swollen and œdematous, and are the seat of considerable deposits, much benefit is frequently derived from massage and galvanism. Each of the affected joints should be massaged for a few minutes, and then galvanism (5 to 10 milliampères) should be applied for a few minutes with the negative pole over the affected region, to be again followed by massage. Under this combined treatment the œdema and deposits frequently disappear rapidly. Probably the beneficial effects are due mainly to the increased circulation of blood and lymph induced, and the consequent absorption that takes place.

The Scotch douche is very useful in the treatment of chronically affected joints. A good-sized stream is thrown with considerable force upon the affected joint, cold water being first employed for half a minute, and then hot ; the latter should be as hot as the patient can bear, and should be continued for one minute. This process is repeated for 15 or 20 minutes. The repeated alternations of temperature produce a stimulating effect upon the circulation about the joint, and so increase tissue change, and favour absorption. Massage of the joint should be resorted to immediately after the douching, as the tissues are then in a relaxed condition. In many cases of chronic articular gout the salt pack is efficacious. It consists of flannel soaked in a warm saturated solution of common salt, which is wrapped round the affected joint, covered with oiled silk and a bandage, and kept on all night. It should be repeated nightly as necessary.

For the stiffness and thickening of joints, careful rubbing with iodide of potassium and soap liniment or with the compound camphor liniment may be resorted to. The thermal baths of Bath, Buxton, Harrogate, Strathpeffer, Llandrindod Wells, Aix-les-Bains, and other spas and mud-baths, are useful in the treatment of cases of chronic articular gout. Treatment by means of baths should, however, be avoided by patients suffering from acute gout, by elderly patients, and by those suffering from any serious cardiac affection.

## ELECTRIC LIGHT AND SUPERHEATED-AIR BATHS.

I have found in many cases that a decidedly beneficial influence on gouty joints is produced by electric light baths, followed by electrical treatment in the form of cataphoresis to the affected joints.

Electric light and superheated-air baths promote the oxidative processes within the body, as is shown by the increased elimination of carbon dioxide from the lungs, and also by the increased metabolism of the body in general. They also stimulate the circulation of both the blood and the lymph in the affected joints and so lead to improved nutrition of the parts. This curative action undoubtedly continues after the treatment has been left off. Such treatment, therefore, is better given intermittently—say, six baths on alternate days; then intermit for two or three weeks, and so on. These baths improve the atrophic condition of the muscles. They cause a temporary elevation of the body temperature, marked reddening of the skin of the part treated, profuse local or even general perspiration, quickened pulse, lowered arterial tension, and generally considerable amelioration of the pain, and in some cases complete disappearance of it for a time. Radiant heat has a greater penetrative effect than other forms of heat, and, in my opinion, the effect is more stimulating. In cases of acute or subacute gout, the pain, as a rule, recurs at varying intervals after a bath, but usually with diminished severity; and in favourable cases a progressive reduction of the pain occurs after the use of subsequent baths.

Undoubtedly many cases of chronic gout do not show much improvement after the use of electric light or superheated-air baths, and I have frequently experienced great difficulty in selecting the cases most likely to be benefited by them. As a general rule my experience has been that cases of chronic gout of long standing, with considerable deposits in the joints, do not derive much benefit from these baths. For such cases undoubtedly much more good can be done by the employment of vapour baths, followed by massage of the affected joints, a method of treatment which is frequently most useful in producing softening and absorption of the deposits. It should, however, be borne in mind that electric

light baths seem to set up improved circulatory and trophic changes in the joints, which apparently are maintained for a prolonged period after the baths have been discontinued. Certainly I have seen in several cases, after a course of from 12 to 18 electric light baths had resulted in but slight improvement, and the baths had been abandoned in despair, a progressive improvement maintained for weeks and even months after the discontinuance of the baths, an improvement which in some cases has resulted in more or less complete cure.

If only one limb is the seat of gout, the question arises as to whether that limb should be locally treated by being placed in a small specially constructed bath, or whether the "entire body" bath should be used. My experience is that the "whole body" bath is in all cases the most useful, with, in the case of the electric light bath, an extra localisation of the heat and light rays on the affected part. That means, according to my experience, that the more extensive the surface to which the heat and light rays are applied, the better is the result. When the ordinary electric light or super-heated-air baths are not obtainable, very good results may be obtained at home by the use of an ordinary blanket-tent with a small opening at the top to let out the hot air saturated with moisture. The hot air is supplied by a ring bunsen gas-burner, or by a large spirit-lamp with a flue passing through an opening in the blanket at the foot of the tent.

In the acute or subacute stage of gout, or when a slight attack of gout has just started, I consider the use of the Turkish bath most undesirable. I have known of its employment in such cases being followed by an exacerbation of the attack and extension to joints not at the time affected. This is a point which should be borne in mind by medical men, as many patients on the first appearance of an attack of gout are apt to have immediate recourse to the Turkish bath, and it is well that they should be warned of the danger they thereby incur.

#### CATAPHORESIS.

Cataphoresis is useful in many cases of chronic gout with considerable deposits in the joints. By cataphoresis is meant electric osmosis, or the transfer through porous partitions



from anode to cathode. The joint may be treated either by immersion in a local bath of the fluid which is to be introduced, the positive electrode being placed in the bath and the negative on the back, or the positive electrode may be kept thoroughly wet by frequent applications of the fluid. The negative electrode should be a large one, about 8 inches by 5 inches, made of zinc and protected by a flannel cover. It is well moistened with warm water, and applied to the lumbar or dorsal region. At the positive pole either potassium bicarbonate or lithium iodide may be introduced into the affected joint. In the former instance the positive electrode is kept thoroughly wet with a saturated solution of potassium bicarbonate; in the latter the joint is painted over with iodine liniment, and a pad of lint soaked in a saturated solution of lithium carbonate is laid over the iodine surface; on the lint the positive electrode, which should be a large flat one, is placed, and closely applied to it. Care must be taken to have everything *in situ* before turning on the current, so as to avoid any shock, and to give an easy, steady flow of current.

#### THE TREATMENT OF IRREGULAR GOUT.

*Gouty Dyspepsia and Acidity.*—In addition to the usual remedies, such as bismuth subcarbonate, sodium bicarbonate, bitters, etc., taka-diastase is a most useful drug in the treatment of gouty dyspepsia. It is made up in the form of tablets containing two and a half grains in each tablet, and one of these should be taken immediately before each meal. The taka-diastase encourages the digestion of the carbohydrate elements of the food, and so prevents the development of fatty acids, which, by their irritating effects, are so common a factor in the development of gouty dyspepsia.

*Hyperchlorhydria.*—The treatment of this condition consists in a proper regulation of the diet by cutting off any excess of the proteid articles of diet, and by neutralising the superfluous acid by the administration of some alkali. A drug that I have found most useful in the treatment of this hyperchlorhydria is hopogan (the magnesium peroxide). It not only gives immediate relief of the pain and discomfort by its neutralising effect on the excess of acid, but it also parts with one-half

of its oxygen, and acts as an internal antiseptic. It is a most valuable drug in many abnormal gastric and intestinal fermentations. It is a white tasteless powder, and is best given in a little milk, in doses of from 20 to 30 grains three or four times a day, taken one hour after meals. If it exerts too great a purgative effect, the dose should be diminished. It is also very useful in allaying the irritation in many cases of gouty pruritus, probably due to absorption of a toxin or toxins from the intestinal tract. In cases of ordinary neurotic dyspepsia, associated with flatulence, the drug is, in my experience, of no value whatever.

*Hepatic Torpor.*—A very common form of irregular gout is due to defective metabolism of the liver, and is known as hepatic torpor, or hepatic inadequacy. In this form, the faeces are pale, generally very offensive, and, as a rule, constipation occurs. Slight jaundice is usually present, as evidenced by a yellowish conjunctiva and muddy complexion, and the urine is highly coloured, of high specific gravity, and very acid. In the treatment of this form of irregular gout the most important consideration is the restoration of the liver to its normal state of activity, and here the alkaline sodium salts are especially useful. There is no better treatment at the outset than a dose of "blue pill" or calomel at night, followed by a dose of Epsom salts or Carlsbad salts in the morning. Subsequently, a pill containing a small dose of "blue pill" or calomel, combined with euonymin and colocynth, will be found most useful. In such cases of gouty hepatic inadequacy a mixture which I have found most beneficial as regards its stimulating effect on the metabolism of the liver, and also of the gastro-intestinal tract, is the following, which should be taken a quarter of an hour before meals :—

|   |                    |   |   |    |          |
|---|--------------------|---|---|----|----------|
| R | Sodæ Bicarb.       | - | - | -  | gr. xij. |
|   | Tinct. Nucis Vom.  | - | - | -  | ℥x.      |
|   | Tinct. Gentian Co. | - | - | -  | ʒss.     |
|   | Sp. Chloroformi    | - | - | -  | ℥xij.    |
|   | Aq. Menth. Pip.    | - | - | ad | ʒj.      |

*Gouty Phlebitis.*—For the treatment of this fairly common form of irregular gout the patient should be kept in the recumbent position, and any sudden movement of the affected limb must be prevented, on account of the danger of detaching a

portion of thrombus and the occurrence of consequent embolism of the pulmonary artery. Equal parts of glycerine and extract of belladonna should be smeared over the affected part, and a linseed poultice with some of the glycerine and extract of belladonna spread on the surface should be applied and renewed every six hours. In addition to this the ordinary treatment of the gouty state must be resorted to.

*Gouty Sciatica.*—For the treatment of this painful affection the patient must be kept in the recumbent position, and in severe cases the pain should be relieved by a hypodermic injection of morphine. Ammonium chloride, given in doses of from 30 to 40 grains three or four times a day, is a very useful drug in the treatment of this form of irregular gout. Two grains of salicylate of quinine should also be given in a pill two or three times a day. These measures should be supplemented by the ordinary treatment of the gouty state.

*Gouty Neuritis.*—Blistering along the course of the affected nerve-trunk is the most rapid way of relieving this painful affection. If such a mode of treatment should not be considered desirable, then iodine liniment may be painted along the course of the nerve-trunk, and hot linseed poultices applied as soon as the iodine is dry, and kept in position by a bandage loosely applied. Internally, iodide of potassium combined with small doses of perchloride of mercury should be given.

*Insomnia in Gouty Subjects.*—Many gouty persons complain of insomnia or restlessness when in bed. This is frequently either toxic in its origin, or is due to a state of high tension in the cerebral arteries. As a rule, the insomnia is not complete, but consists of restlessness, interspersed with varying intervals of light or broken slumber. In such cases, careful attention should be given to the state of the pulse, the heart, and the condition of the urine. In many cases it will be found that the pulse is of high tension, and is associated with accentuation of the aortic second sound, perhaps reduplication of the first sound in the vicinity of the apex of the heart, and a slight degree of albuminuria. In such cases the insomnia is best relieved by the administration at night of small doses of "blue pill" or calomel, combined with full doses of the extract of hyoscyamus. Bromide of ammonium may also be given as a sedative, and as a drug which reduces arterial tension, but,



with such patients, it is most undesirable to resort to the use of the ordinary hypnotic drugs.

*Gouty Eczema.*—Of the purely internal causes of eczema, disorder of the gastro-intestinal tract should, in my opinion, be placed first. The gouty person is one who is not only liable to such disorder and to faulty assimilation of food, but is also particularly vulnerable to inflammations of the synovial and mucous membranes, and of the skin.

In the treatment of this form of irregular gout special attention should be given to two details. One is to see that the bowels are freely opened, which, at the outset, may be secured by the administration of "blue pill" or calomel, followed by a saline; the other point is that entire abstinence from alcohol is most desirable, at all events during the treatment and persistence of the eczema. It is best that any form of alcohol should be abstained from, but the prohibition applies more especially, in my experience, to the red wines. I have met with several cases occurring among gouty individuals past the middle age of life in whom two or three glasses of claret or burgundy will, in the course of a few hours, cause the development of an eczema. During the irritative stage of dry gouty eczema I have found the application of a lotion consisting of—

|                           |   |   |        |
|---------------------------|---|---|--------|
| Liquor Plumbi Subacetatis | - | - | 3j.    |
| Liquor Carbonis Detergens | - | - | 3j.    |
| Aqua Sambuci              | - | - | ad Oj. |

most soothing, especially if followed by the use of a simple dusting powder, such as cimolite powder. For the acute moist type of eczema a similar lotion, but with a preparation of opium replacing the tar-solution, is advisable.

When the eczema is in a chronic condition much benefit is usually experienced from immersion in sulphur-baths, such as those of Harrogate, Strathpeffer, Aix-les-Bains, etc. After the bath the skin should be carefully dried, and a dusting powder, such as cimolite powder, freely applied. In cases of gouty eczema and gouty pruritus a careful dietary must be enforced, care being taken to forbid all articles which the experience of the patient in the past has shown to produce dyspepsia. Persons who are subject to attacks of gouty eczema should avoid such acid fruits as strawberries, gooseberries, apples, and pineapples; rhubarb also should be

excluded from the dietary. As regards the medicinal treatment of gouty eczema, my experience is that it is not necessary to give the ordinary anti-gout remedies, such as colchicum, etc. It is much more important to treat the dyspepsia and the catarrhal condition of the gastro-intestinal tract, which are generally present as associated or causative conditions, by the administration of subcarbonate of bismuth with the bicarbonate of sodium or the bicarbonate of potassium.

In cases of gouty pruritus, or, as it is sometimes termed, latent gouty eczema, the severe itching is frequently relieved by the use of carbolic acid lotion, or the itching attending pruritus and urticaria may be relieved by the application of the following lotion :—

|                      |   |   |   |            |
|----------------------|---|---|---|------------|
| Liq. Plumbi Subacet. | - | - | - | ʒij.       |
| Tinct. Opii          | - | - | - | ʒiv.       |
| Aq. Rosæ             | - | - | - | ad ʒviiij. |

*Treatment of Retrocedent or Metastatic Gout. Immediate Treatment.*—If the symptoms are urgent some brandy should be immediately given, and, if necessary, a hypodermic injection of morphine should be administered, provided marked albuminuria does not exist. If the metastatic seizure is a severe one, and especially if it affects either the heart or brain, it may be desirable to reinduce an attack of articular gout by placing the feet in a hot mustard and water bath, containing a full tablespoonful of flour of mustard to a gallon of water.

*Treatment of the Gastro-intestinal Form.*—A mustard leaf should be applied to the epigastrium, and a mixture containing bismuth subcarbonate, sodium bicarbonate, and hydrocyanic acid should be given. If there is much depression suitable stimulants must be employed.

*Treatment of the Cardiac Form.*—Heart tonics, such as digitalis, convallaria, or strophanthus; and brandy, should be administered. A mustard leaf may be applied to the epigastrium. If an anginal attack occurs, then, in addition to this treatment, a dose of nitro-glycerine should be given at once, or an inhalation of nitrite or amyl employed, and, if necessary, a mustard leaf should be placed over the præcordial region. For the treatment of syncopal attacks the patient should be immediately placed in the recumbent position, with the foot of the sofa or bed raised; some hot brandy and water should be given, warmth and friction applied to the extremities,

and a mustard leaf placed over the epigastrium.

*Treatment of the Cerebral Form.*—If the patient is plethoric, and if the pulse is hard, and stupor or coma intervenes, venesection should be performed, and from eight to sixteen ounces of blood withdrawn. In less urgent cases six leeches may be applied to the mastoid region. Five grains of calomel should afterwards be administered by the mouth, and a turpentine enema given.

#### DIET.

No hard-and-fast lines as to dietary can be laid down in the treatment of gout. Each individual must be carefully considered as regards his habit of body, his capacity for the digestion of different articles of food, the amount of exercise he is able to take, and the nature of his work. Derangements of the gastro-intestinal tract constitute a most important factor in the development of acute, chronic, and irregular gout. It is, therefore, of the utmost importance to secure and maintain a healthy condition of the gastro-intestinal mucous membrane, and a normal daily evacuation, in order to guard against auto-intoxication, which is undoubtedly an early factor in the development of the gouty condition. The individual who is subject to gouty attacks can certainly diminish the number and severity of the attacks, and in many cases can prevent their recurrence, by careful attention to diet, to the quality and quantity of food taken, to exercise, and to a sufficient daily action of the bowels. It is my custom to question closely each gouty patient whom I see, not only as to the nature of the beverages taken, but also as to their amount; and my general experience is that the great majority of individuals suffering from gout take an insufficient quantity of water to drink. Consequently there is an insufficient flushing of the liver, kidneys, and other organs and tissues, and, therefore, imperfect removal of waste and toxic products. More especially does one find this insufficient consumption of fluid among female patients, in many cases due to the absurd and erroneous belief that a diminution in the amount of fluid taken tends to keep down the body-weight and to prevent the occurrence of obesity. For the treatment, as well as for the prevention, of the gouty condition, the free consumption of water, apart from meals, is most desirable.



If, as is probably the case, the toxin or toxins of gout are produced in the intestinal tract, it is obvious that the first efforts at treatment should be directed to obtaining a healthy alimentary tract, and to modifying those habits of living which have caused gastro-intestinal derangement.

Before deciding how these objects can be attained, it is first necessary shortly to consider some points in the digestive processes which take place in the small intestine. Under normal conditions bacterial decomposition does not take place in the upper part of the small intestine, as the duodenum and upper portion of the jejunum are practically sterile. The conditions which favour increased bacterial growth in the intestine are (1) increase in the amount of proteid food (the number of bacteria in the intestine varying directly with the amount of proteid food), and (2) the reaction of the intestinal contents. As long as the contents are acid, bacterial growth is inhibited, but when, owing to gastric or intestinal dyspepsia, the intestinal secretion is changed, the reaction of the intestinal contents changes, and great increase in the number of intestinal bacteria takes place, while at the same time their pathogenicity is increased. Therefore, the growth of bacteria in the intestinal tract and their pathogenicity will vary directly with the amount of proteid food and the amount of catarrh present.

As regards the question of meat it must be remembered on the one hand that animal foods constitute to the majority of people the most attractive and appetising forms of diet, and are therefore likely to be taken in excess; hence the necessity for limiting the amount to be taken. But on the other hand it must be borne in mind that it is most desirable to increase the combustion and the oxidative powers within the tissues. In my opinion it is absolutely erroneous to exclude from the dietary of the gouty such articles as meat, fish, and tea because they are assumed to contain uric acid. The so-called estimations of uric acid in them are not, as I have previously pointed out, estimations of uric acid at all. Moreover, the deduction is an erroneous one that because uric acid is a nitrogenous body, it must therefore be directly derived from nitrogenous constituents of the food, the consumption of which must consequently be avoided. Even

if uric acid were present in the articles of food referred to, it would not alter my opinion as to their suitability, considering that they have stood the test of so prolonged a trial. Yet there are some who do not hesitate to call these articles of food, which are so extensively consumed, poisons, mainly, as far as I can gather, because these foods do not happen to agree with themselves.

The diet of gouty patients should be simple, that is, the meals should not be made up of too many articles. Simplicity of food means facility of digestion. Certainly meat, even red meat, should not be excluded from the diet. No class of food-stuff is so productive of energy as animal food; and as most subjects of chronic gout are suffering from lowered vitality and want of tone, animal food, at all events in moderate quantity, is distinctly indicated. My experience supports the truth of this view, as I advise in the great majority of cases of chronic gout the taking of at least one meat-meal a day. The exclusion of any article of diet, or of any class of food, without taking into account the surroundings of the case and the peculiarities of the individual is unscientific. Those articles of diet that are known in the individual to favour intestinal fermentation and putrefaction should certainly be avoided, and it may be taken, I think, as a general rule that a sense of discomfort after a meal indicates that some article or articles of food have been taken which are not beneficial to the individual in his present condition. I attach great importance in such cases to the reduction of the starchy articles of food, but not to the total exclusion of, what I believe to be comparatively harmless, the potato. It is remarkable how frequently one hears from gouty patients the emphatic statement "I never eat potatoes." I must confess that I do not know of any good and sufficient reason for this wholesale condemnation of this common article of diet. Undoubtedly amongst those gouty patients who suffer from an inability to digest starchy articles of diet--in other words, who suffer from amylaceous dyspepsia--a reduction for the time in the amount of starchy foods taken, including potatoes, is desirable; but the recognition or the existence of amylaceous dyspepsia is a fairly easy matter, and when present it can be suitably treated. Certainly those who are gouty and fat should be

very sparing in the use of potatoes, as of other carbohydrate forms of food. I wish, however, to protest against the too general exclusion from the food of the gouty of so common and useful an article of diet as the potato. Equally wrong, in my opinion, is the total exclusion of sugar from the dietary of all gouty individuals. Undoubtedly in certain individuals sugar may do harm, as in the cases of gouty persons who are fat, or who suffer from glycosuria, or who are prone to attacks of eczema, and in such it should be cut off; but that is no reason for the exclusion of it from the dietary of all gouty patients, especially of those who are at the same time gouty and thin. I know of many gouty individuals who take sugar with absolute impunity. Some gouty subjects undoubtedly digest very badly all starchy articles of diet, and in such cases fats may well take the place of starches. Fat bacon, properly cooked, is generally well digested by gouty individuals. A fair proportion of vegetable food should be taken with two meals each day. The choice of vegetables will depend upon the digestive capacity of the patient; but, excepting the potato, as a rule those vegetables that grow above ground are preferable to root-vegetables.

Stated as a general principle, a person who is subject to gout is better without alcohol in any form. There are, however, some who require a little alcohol, either to aid digestion or to enable them to get through their work, and here I am entirely in accord with the advice given by Goodhart, that, if a man requires any stimulant at all, it is a matter he must decide by experimenting for himself, for no medical man can tell him. If alcohol is necessary or desirable, the form in which it is to be taken is frequently a matter which the patient can decide better than the medical man; but I would insist upon the importance of definitely limiting the amount to be taken, and of restricting its consumption absolutely to meals. Some patients find that a little whisky or brandy suits them best, others find a light still Moselle preferable, while a few, but in my opinion only a very limited number, find that a light claret agrees best with them. Champagne is a wine which is seldom suited to the gouty, especially if taken daily. Rough cider, that is, the completely fermented apple-juice, taken in moderation, agrees



well with most gouty subjects, but the bottled or champagne cider, which is imperfectly fermented, should never be used by gouty individuals.

As previously stated, as little complexity as is possible in the meals is the main desideratum in the dietary of the gouty, and in a few intractable cases of chronic gout it may even become necessary to reduce the dietary for a time to the simplest possible condition, namely, to two articles of food—lean meat and water. There are a few cases of *chronic* gout which undoubtedly improve and even recover on an exclusive diet of red meat and hot water. These are generally cases of chronic gouty arthritis which have failed to yield to the ordinary methods of treatment, and which are accompanied by dyspepsia, flatulence, acid eructations, pyrosis, and offensive stools. I have successfully treated a few such carefully-selected cases of chronic gout by the employment of this, the so-called "Salisbury," treatment. It is essential, before placing a patient on such diet, that the urine should be carefully examined, as any advanced condition of kidney disease contra-indicates the employment of such a dietary. If the evidence of kidney derangement is only slight, the adoption of the dietary is not contra-indicated; but the urine must be carefully examined every two or three days, as any considerable increase in the albuminuria would at once be an indication for the discontinuance of this special diet. Gouty patients suffering from organic heart disease with any failure of compensation should never be placed on this dietary. The dietary consists in the patient drinking from three to five pints of hot water daily, the water being taken from one hour to one hour and a half before each meal, and half an hour before retiring to rest, and eating from two to four pounds of beefsteak daily. The meat should be freed from fat, gristle, and connective tissue, thoroughly minced, mixed with a little water, and then warmed through with gentle heat until it becomes brown in colour. A little salt and pepper may be added, and the meat eaten in this form or made up into cakes and cooked on the grill. Later on in the treatment, part of the steak may be taken grilled, or a grilled lean mutton chop may be substituted for one of the daily meals. The course of treatment should last for from four to twelve weeks, after which a gradual return to ordinary diet should be made.

THE USES OF MINERAL WATERS IN THE TREATMENT  
OF GOUT.

If gout is primarily due to the absorption of toxins from the intestinal canal dependent upon a catarrh of the intestinal mucosa, many of the natural mineral waters must be efficacious in altering the catarrhal condition and in improving the digestive processes; also the secondary effect of increasing the flow of bile and of thoroughly washing out all the tissues, so as to get rid of toxic accumulation, is important.

The value of a given mineral water in the treatment of gout depends greatly on the main object with which it is taken. For instance, it may be taken to remove gouty deposits, or to stimulate the action of a sluggish liver and to relieve portal congestion, or for the treatment of gouty dyspepsia, or to relieve the bowels in cases of torpor and gastro-intestinal catarrh, or to act on the kidneys, or to relieve gouty affections of the skin. Now it is manifest that any one mineral water is not likely to produce all these effects, and it is also obviously conceivable that a mineral water which might be most useful to effect one of these purposes might prove injurious if employed to effect another. No doubt considerable error has arisen from indiscriminately sending gouty patients to a particular spa, without giving due consideration to the question as to whether the water of that spa is suitable for the treatment of the specific gouty disorder from which the patient is suffering. It is well to bear in mind that a patient should not be sent to a spa during the acute stage of gout, nor if suffering from marked organic disease of the heart or kidneys.

It is especially in cases of chronic gout, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, sluggish action of the liver, gouty eczema, gouty glycosuria, and of other forms of irregular gout, that mineral waters prove so valuable, whilst the various baths, combined with massage, are very useful in producing softening and absorption of the deposits in the joints and other tissues.

*Balneology.*—Useful as may be the drinking of a water at a spa, yet equally, and even in some cases more useful, is the encouragement for therapeutic purposes of the functions of the skin by balneological methods. The skin is the largest organ of the body, and, as would be expected of such an organ, it

possesses various and complex functions. Amongst its functions are (1) the excretion of toxic bodies, the retention of which proves harmful and ultimately fatal to the organism; (2) the power that it possesses through its nerve-endings of stimulating distant organs and tissues; and (3) its heat-regulating power. The success of balneology depends upon the recognition of the powerful aid which can be given by the skin in restoring the normal balance.

Heat, whether applied in the form of water baths or in that of air baths, lowers the arterial pressure and raises the venous pressure, as a consequence of the relaxation of the muscular coats of the arteries and of the arterioles that is induced.

The flushing effect of a course of warm baths on the clogged periphery of the circulation is useful in many diseases, and this beneficial influence extends to the heart, since the opening up of the peripheral circulation eases the work of the left ventricle, which consequently is able to deliver its load more and more completely, and retain less and less residual blood as the peripheral resistance diminishes.

The cabinet electric light bath in which the whole body is enclosed up to the neck is a powerful means of the reduction of the arterial blood pressure, and is serviceable in the treatment of high arterial pressure, such as that observed in granular kidney. In addition to its pronounced action on the circulation, it is a powerful stimulant of the cutaneous excretion of waste products.

Warm baths are of great therapeutic value as vaso-motor relaxants, but there is another group of baths possessing quite different properties—namely, those of cardiac and vaso-motor stimulation. These are percussive baths, massage baths, and baths of alternating temperature.

Percussive baths are represented by the various forms of douche and needle baths. The general effect on the blood pressure is to raise the arterial and to lower the venous pressure. George Oliver states that the needle bath, doubly alternating in temperature (*i.e.*, falling from warm to cool, then rising to warm, and again falling to cool), with a hot descending spinal douche, has the most powerful effect in raising the arterial pressure. There is no doubt that the effect of the percussion of water on the peripheral vessels is greatly inten-



sified by varying the temperature, and especially by allowing it to dip to the lowest ranges. Apart from percussion, the mere alteration of temperature, when considerable, has a remarkable effect on the blood pressure, and especially is this the case when the cold plunge is taken either after a very hot water bath, or after a hot air or Turkish bath. It is on this account that the subjects of advanced chronic gout and of other diseases, associated with high arterial tension, should avoid the cold plunge, and the cold needle bath or douche after a hot bath.

#### CLIMATIC TREATMENT.

A fairly bracing air with a low relative humidity is, in my experience, the most suitable for the gouty. High mountain situations, and valleys where there is an excessive relative humidity of the air, are alike unsuited to such patients. Especially desirable is it to avoid exposure to the cold east and north-east winds which prevail in this country in the early months of spring, and which are apt to be provocative of what has been called a "chill on the liver," a condition which no doubt is brought about by the chilling effects of these winds on the skin, and a consequent reflex affection of the metabolism of the liver-cells. As a winter resort for the gouty, I know of no better climate than that of Egypt, where, at Helwan (Helouan), thermal, sulphurous, and saline waters exist, and excellent baths are obtainable. The air of Helwan is that of the desert; the average winter temperature is 60° F.; the relative humidity from November to April is only 30 to 60 per cent.; while the average rainfall for four consecutive winters was only three-quarters of an inch. For the spring, summer, and autumn months we fortunately have for our selection a large number of health resorts in this country and on the Continent, the climates of which are well suited to the gouty. My experience is that residence by the sea is not suited to most cases of gout, and this especially applies to cases of gouty eczema.



## ON THE RELATION OF GOUT TO GRANULAR KIDNEY AND TO LEAD POISONING.

By SAMUEL WEST, M.D., F.R.C.P.,

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EXCESS of uric acid in the blood, or "urataemia," as Sir William Roberts named it, we are bound, so far as our present knowledge goes, to consider as the essential factor in gout. That being granted, enquiry into the cause of gout involves the study of the natural history of uric acid in the body and the conditions which determine its excess in the blood.

Investigation shows that the uric acid in the blood depends, not upon the protein of the food, but upon the purin-bases in it, and that these purins are largely destroyed by oxidation, chiefly in the liver.

It follows that excess of uric acid in the blood may be due to—

1. Excessive ingestion of purins in the food.
2. Diminished destruction of others in the liver.
3. Diminished excretion of uric acid by the kidney, and this may be the consequence of—

(a) Defective action of the kidney owing to organic or functional disease.

(b) To the absence of some intermediate organic nitrogen-compound in the blood, from which uric acid is under ordinary circumstances, formed.

Given the essential condition, viz., urataemia, it is necessary next to study the conditions which determine the deposit from the surcharged blood of uric acid or urates, either within the body, as in the joints, or external to it in the urine or urinary passages.

What has just been written would seem to imply a close relation between gout and uric-acid gravel or calculus. Yet the connection between them is by no means so close or simple as might be supposed, for urine may contain excess of uric acid without deposit, and may deposit much when the amount

is not large. In cases of uric-acid calculus and gravel a history of previous gout is rare, and in places where stone is common, as in Scotland or in Norfolk, gout is rare ; while in India among the natives uric-acid gravel and calculus are frequent, but gout unknown.

Deposits of uric acid are not infrequently seen post-mortem in the kidney as minute nodules in the cortex, and as streaks in the pyramids, but these have clearly no relation with gout, and they are commonest in children who have died of very various affections. In adults they are very rare in fatal cases of gout, and are more frequently found where the kidneys are otherwise sound, and where there is no other evidence of gout, clinical or pathological. Thus it appears as if the conditions leading to gout and uric-acid gravel or calculus respectively were more or less antagonistic.

Given the deposit, many of the results are the more or less mechanical and necessary consequences of the presence of a foreign body such as the deposit of uric acid or urates becomes. In the joints the deposition leads to the inflammatory and other symptoms characteristic of acute gout, and subsequently to the more permanent changes associated with chronic gout. So, too, in the kidney—assuming the connection, which I have already said does not seem really to exist, between uric-acid calculus or gravel and gout—many of the changes of the so-called gouty kidney are the pathological consequences of a calculus, irrespective of its nature.

The acute attack of gout is associated with certain changes in the urine. The urine is concentrated, strongly acid, of high specific gravity, and throws down on standing a copious deposit of lithates. These changes have little to do with gout itself, but are to be referred to the general dyspeptic and constitutional disturbance by which the acute attack of gout is attended, for urine with the same characters is passed in many other disorders, especially those of a febrile character, *e.g.*, rheumatic fever and pneumonia.

As in these conditions, so in acute gout, the urine may temporarily contain albumen, usually as a trace only, or, at any rate, in small amount. Sometimes, however, it is present in considerable quantity. Thus I have seen specimens in which, on boiling, it was found to be half or more, and in



one case the urine became solid. Yet in all these instances alike the albuminuria was transitory, lasting only during the acute stage, and after a few days disappearing entirely.

The occurrence of albuminuria during acute gout has been referred to irritation set up in the kidney by the passage of the acid and concentrated urine, but the irritation does not, at any rate, lead to acute inflammation, for the association of acute nephritis with gout is extremely rare, and patients suffering from acute nephritis do not develop symptoms in any way resembling those of gout. If a gouty patient develop acute nephritis, it is either an accidental and independent affection, or an acute attack resulting from previously damaged kidneys—in other words, from antecedent interstitial nephritis.

The repeated irritation of the kidneys set up by repeated attacks of gout might lead to degenerative changes of a permanent kind, and this is the explanation often given of the association of long-standing gout with chronic interstitial nephritis.

“Gouty kidney” is a very unscientific and misleading term, for the gouty nature of it is often a matter of personal opinion only. The gouty kidney, as often described, presents a mixture of fatty degeneration with interstitial change, and may have nothing whatever to do with gout. Thus, if the presence of a uric-acid calculus or gravel be considered proof of gout, the pathology of gout would include the effects of this calculus upon the kidney, and would thus embrace many of the conditions often described by the term “surgical kidney”—another equally indefinite and misleading expression. But if it be true that there is not only no relation between gout and uric-acid calculus or gravel, but rather an antagonism, all the resulting pathological conditions must be excluded.

In other cases the lesions of the so-called gouty kidney are due to an atheromatous condition of the vessels, the fatty degeneration of the cells being the result of the imperfect circulation. There is no direct relation between gout and atheroma, except that chronic gout is met with usually in elderly persons. Similar conditions of the kidney may be met with in old persons with atheromatous vessels who have never had any manifestation of gout in their whole life.

It now remains to consider the relation which exists between gout and chronic interstitial nephritis or granular kidney.

The association of gout and granular kidney is a close one, and appears clearly, as well in the statistics of gout as in those of granular kidney, for many gouty patients are found to have granular kidney, and among cases of granular kidney gout is a very common complication. Thus, Ord and Greenfield found that of hospital patients who had uratic deposits in the great-toe joint two-thirds had granular kidney, and in the remaining third the kidneys were not sound. Norman Moore, in 49 cases of granular kidney, found uratic deposits in 22. Pye-Smith, in 10 cases of fatal gout, found that every one had interstitial nephritis.

On the other hand, granular kidney and gout are not necessarily associated. Thus, in 69 cases of granular kidney, Dickinson obtained distinct evidence of gout only in 16. And, again, Norman Moore's figures show a marked difference between the sexes, for of 26 cases of granular kidney in women only five showed uratic deposits, or less than half the relative number in men.

Further, many persons have gout all their lives, and yet the kidneys are found healthy at the end, or show changes which are connected with atheromatous vessels, the atheroma being due to age rather than to gout. As stated, gout does not produce atheroma at all, or at the most only aggravates or intensifies the natural tendencies of age.

If then, on the one hand, some patients may have gout and never develop granular kidney, and on the other, some may have granular kidney and never gout, however close the relation between these two conditions may be, it is not a constant or essential one.

Gout and granular kidney are, both of them, very common affections, and sufficiently common to be not infrequently associated accidentally without any casual connection. Still, making all allowance for this, the association seems altogether more common than mere coincidence could account for.

It is difficult to discuss satisfactorily the relation of two conditions to each other, when neither condition admits of precise definition, for some authorities are more easily satisfied

in the diagnosis of gout than others, and while some place all forms of chronic interstitial nephritis in one and the same category, others are not so comprehensive, and regard granular kidney as a definite clinical disease, of which the interstitial nephritis is only a part.

Accepting for the present purpose the frequent association of gout and granular kidney as established, the question of the relation in which they stand to one another still remains to be dealt with. Does gout cause granular kidney, or does granular kidney lead to gout, or is there some less direct relation between them?

Gout is a disease of the later half of life, lasts many years, and is rarely fatal of itself. Granular kidney is a disease of earlier life, and terminates at a much earlier average age, and the general clinical history of gout is not that of granular kidney.

The relation of lead-poisoning to gout will throw some light upon the question now under consideration.

The association between both these conditions and granular kidney is very close. Experimentally, lead-poisoning has been shown to cause in acute cases epithelial degeneration in the kidneys, and in chronic cases, interstitial change in addition; in these respects resembling what has been described in gout. In many cases of lead-poisoning the kidneys are found to be granular. This is especially true of the fatal cases, and, though post-mortem figures may not prove that lead produces granular kidney, it clearly establishes the fact that the association of the two conditions is very grave.

Between lead-poisoning and gout there is also a close relation. This Garrod's original observations established, and they have been amply confirmed by other observers. Garrod, in 100 cases of gout, found 33 cases of lead-poisoning, and Duckworth 25 out of 136. Yet the association is by no means so close as these figures appear to prove. Thus Oliver has pointed out that, among the lead-workers in the district of Newcastle, gout is rare, but that, though the native lead-workers rarely develop gout, the workmen who go there from the South do—a difference which is probably to be explained by a difference in the habits of the two classes, especially in respect of drink. Again, in Berlin, Frerichs did not find in 163 cases of lead-



poisoning a single instance of gout.

Where chronic lead-poisoning and gout are associated with granular kidney, the patients are very cachectic, but this cachexia may as well be the result of granular kidney as of lead.

The conclusion is thus arrived at, that, though chronic lead-poisoning may lead to some interstitial changes in the kidney, it does not of itself produce granular kidney.

Another conclusion may also be drawn, viz., that patients whose kidneys are unsound, and, therefore, functionally defective, are especially liable to suffer from the effects of lead, and that the association of the two conditions may easily lead to serious or even fatal results.

These conclusions are much the same as those to which the considerations of the relation between gout and granular kidney have already led. It may in both cases be explained as the result of renal inadequacy—the elimination, in the one case, of the lead, and in the other of the uric acid being interfered with; while it is possible that lead, by modifying the general metabolism of the body, may directly affect the production or elimination of uric acid, and thus lead to the excess in the blood which is the essence of gout.

We thus arrive at much the same conclusion in respect of both gout and lead in relation to granular kidney, viz., that though each may produce chronic changes in the kidney neither causes granular kidney. But the presence of granular kidney greatly increases the liability of the patient to gout on the one hand, and lead-poisoning on the other, or to both together, and in each affection alike greatly increases the gravity and risk.



## THE CARDIO-VASCULAR MANIFESTATIONS OF GOUT.

By PERCY KIDD, M.D., F.R.C.P.,

*Physician to the London Hospital.*

IF by the cardio-vascular manifestations of gout we understand all disorders of the circulatory system occurring in gouty subjects, it may safely be said that these are many and various. The cardio-arterial lesions of granular kidney, by some writers called the gouty kidney, are well recognised, and need only be alluded to. At the same time it must be allowed that the relations between gout and chronic interstitial nephritis are not so intimate as the term "gouty kidney" would suggest. Of the other organic affections of the heart associated with gout, but unconnected with chronic renal disease, the most important and well defined are those that depend on arterial degeneration. These include lesions of the aorta and aortic valves, and sclerosis of the coronary arteries, with its various consequences. Mitral disease is less common, and is generally secondary to aortic or myo-cardial changes.

Duckworth considers that mitral incompetence may be the direct outcome of a gouty sclerosis of the valvular curtains, and that stenosis may occasionally result from the same cause. But it may be doubted whether mitral stenosis is ever dependent on gout. Even when it is met with in gouty patients, the possibility of an old, forgotten attack of rheumatism in childhood can rarely be excluded. For it is admitted that we may have rheumatism in youth and acquire gout in later life.

Milner Fothergill, in a chapter on the "Gouty Heart," devotes the whole of it to a description of the cardio-valvular changes of granular kidney, which he seems to assume is merely an expression of gout. Duckworth also insists on the gouty associations of chronic interstitial nephritis and sclerosis of the coronary arteries, but he further contends for a close connection between gout and various functional diseases of the heart.

Mitchell Bruce, in a very suggestive paper on "The Gouty Heart," ascribes a very wide rôle to gout in the causation of functional cardiac affections, which, in his opinion, are especially prone to occur in the subjects of irregular or masked gout. W. Ewart follows Bruce fairly closely, and considers that the

term "gouty heart" should be reserved for the functional varieties of cardiac disease dependent on this diathesis. G. W. Balfour alludes briefly to the influence of gout in the production of arrhythmia cordis, and also of what is now called Stokes-Adams disease. But most text-books make little or no mention of the gouty heart.

The cardiac symptoms of most frequent occurrence in gout are irregular action of the heart, palpitation, tachycardia, bradycardia, syncope, angina pectoris, or anginoid attacks. According to Mitchell Bruce, who gives the fullest account of this subject, these symptoms may alternate with frank gouty paroxysms, or may succeed to digestive disturbances traceable to some indiscretion in diet. At other times cardiac manifestations may precede all other indications of gout, and may give a clue to other symptoms that have previously proved baffling to diagnosis, such as diarrhoea, flatulence, giddiness, insomnia, wandering pains or heat in the joints, and mental anxiety. People who suffer from symptoms of gouty heart are usually at or about the age of 40, inclined to stoutness, or beginning to get stout. Such persons commonly take little exercise, live freely, and are often capable of a large amount of hard mental work. There may be a history of previous articular gout, or merely of a family tendency to the disease.

In these patients the pulse is generally of moderate or low tension, the arteries are not as a rule thickened, and the physical examination of the heart gives the impression of the organ being somewhat large and flabby, without any evidence of valvular disease. Such cases seldom develop the pronounced cardio-arterial lesions of granular kidney, which represent a late stage in the complaint. The evidence of a gouty basis in these cases is said to depend on—

1. A personal history of declared gout.
2. A personal history of free living and occasional explosions of irregular gout.
3. Relief of these symptoms by anti-gouty treatment, *e.g.*, purgatives, exercise, spare living, alkaline salts.
4. A family history of gout, migraine, gravel, glycosuria, asthma, and their allies.

If recognised early, the prognosis is favourable, as the disease is very amenable to treatment.

It will be seen that Mitchell Bruce's conception of the gouty



heart differs widely from that put forward by Milner Fothergill. According to the former, the condition is essentially of a functional order at first, though, if untreated and neglected, it may pass into the state of organic disease. Whereas for Milner Fothergill the gouty heart represents a late stage in the developments of chronic interstitial nephritis.

The former view is an attractive one, encouraging us to group together many otherwise obscure cases on a definite etiological basis. One difficulty about accepting this view is that the existence of a gouty taint in many cases is a matter of opinion which cannot be put to the proof. In the case of persons who have suffered from articular gout the position is comparatively simple. But Mitchell Bruce expressly states that cardiac affections are more liable to occur in the subjects of irregular gout. The symptoms of irregular gout are somewhat indefinite, and are capable of various interpretations.

It is not claimed that the cardiac symptoms are in themselves characteristic, their gouty nature being inferred from their associations. But it is obvious that there is a danger of attributing many symptoms that we cannot otherwise explain to gout. This pleases large sections of the public, who must have a label for every ailment, and, as we all know, there is a positive glamour about uric acid. Until we possess a reliable clinical test for gout, the recognition of the disease in its incipient stage must remain a matter of considerable difficulty.

The arterial degeneration of gout has been alluded to. Mention may briefly be made of the so-called capillary hæmorrhages that occur in the bladder, the conjunctiva, and the nose (Duckworth). It is uncertain what the nature of the vascular change is in such cases. Dead fingers and flushings are also met with in some gouty people (Duckworth). The relations of phlebitis or thrombosis of veins to gout are well known, though perhaps there is a tendency to regard phlebitis in a middle-aged or elderly subject as gouty, whether any definite gouty antecedents can be discovered or not.

Duckworth: *A Treatise on Gout.*

Milner Fothergill: *Diseases of the Heart.*

Mitchell Bruce: *THE PRACTITIONER*, 1905.

W. Ewart: *Gout and Goutiness.*

G. W. Balfour: *Diseases of the Heart and Aorta.*



GOUT IN RELATION TO DISEASE OF THE  
NERVOUS SYSTEM.

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THE relations of gout to diseases of the nervous system are, for the most part, indirect. An acute attack of gout may be ushered in or accompanied or succeeded by grave nervous disturbance—even acute maniacal disorder—but this is not common. Severe neuralgic pains, in parts other than that acutely inflamed, and considerable irritability or depression, may be present during an attack of gout, but no grave structural alteration in the nervous system is to be apprehended as an immediate concomitant or effect of the seizure. Yet it cannot be denied that manifestations of nervous disorder, frequently of considerable importance, tend to occur in gouty persons, and many such diseases are directly or indirectly the result of the gouty state.

It has long been recognised that repeated attacks of gout lead to cirrhotic changes in the kidney, and such changes are usually associated with high blood pressure and thickened blood vessels—the conditions, in short, which are likely to lead to cerebral hæmorrhage. And, of course, cerebral hæmorrhage is a common cause of paralysis of one side of the body (hemiplegia), the actual degree of the paralysis and the distribution of the weakness being dependent upon the extent of the hæmorrhage and its position in the brain. Similarly, also, the thickening of the arteries, already alluded to, if associated with a weakened and dilated heart, favours the occurrence of thrombosis, and this, just like hæmorrhage, if it affects cerebral vessels, will lead to paralysis of varying degree and distribution. So that in any case of hemiplegia, the history even of one attack of gout, still more the history of repeated attacks, is of great significance in reference to the ætiology of the condition.

It has long been known that lead workers are liable to

gouty manifestations. Yet this association, according to the late Sir William Roberts, "is scarcely noticeable except in a population among whom gout from other causes is prevalent." And Sir Thomas Oliver, from his large experience among lead workers in the North, says that in the North there is not that intimate relationship between gout and lead poisoning that is noticeable, *e.g.*, in the metropolitan area. "Workmen from the South," he says, "develop it in the North of England. The natives of the North, though equally exposed, seldom become gouty, even when the kidneys are affected." And thus it may be said to be clear that the peculiar nervous disorder prevalent among lead workers, the so-called "lead palsy," is not related to gout, and it would seem that not even does gout predispose to it in lead workers.

In the gouty, glycosuria is of not infrequent occurrence. It is often transient, clearing up quickly under an appropriate dietetic treatment. It sometimes, however, eventuates in true diabetes. The researches of Williamson have shown that in diabetes we have a condition which frequently gives rise to changes in the spinal cord, especially to sclerotic changes in the posterior columns, similar to those met with in *tabes dorsalis*. These are associated with absence of knee jerks and weakness of the limbs, and also, not infrequently, with *paræsthesia*. But glycosuria, even of temporary duration, is not infrequently associated with signs and symptoms indicating not central but peripheral changes—peripheral neuritis—indicated by absence of knee jerk, *paræsthesia*, and weakness of the lower limbs. No doubt the glycosuric patients who are the subjects of this disorder are frequently also alcoholic, and it may be asked, "Are not these changes really the result of alcoholic neuritis?" This is a very pertinent enquiry, and it cannot be denied that in some cases alcohol probably plays a part in the production of the condition. Yet in some cases alcohol is used so sparingly that its influence must be slight, and in all the cases the clinical condition differs materially from that met with in true alcoholic neuritis, for it is slighter in degree, the weakness is usually confined to the lower limbs, there is little or none of the exquisite tenderness to pressure of nerve trunks so invariable in alcoholic neuritis, nor is there the great tendency to contractures in muscles, met with in that condition. Further,



there is usually an absence of the mental changes—loss of memory especially—met with in alcoholic cases. So that we must recognise the existence in the gouty of a true glycosuric peripheral neuritis quite independent of alcoholic peripheral neuritis.


Apart from the presence of glycosuria, evidence of changes in the function of isolated peripheral nerves is frequent in connection with the gouty state. There is little doubt that sciatica—although it may arise in other ways—is frequently present in the gouty, and is sometimes directly due to that state. The same is true of anterior crural neuritis, and although I quite agree with Dr. William Bruce that in many, perhaps most, cases of sciatica there are associated arthritic changes in the hip joint, I believe there are some in which the neuritis is a primary condition. Brachial neuritis also is common in the gouty, and in that condition arthritic changes at the shoulder are almost invariably associated with the neuritis. Yet even brachial neuritis I have known occur apart from any recognisable arthritic change in a patient who was the subject of gout. In all these conditions the existence of the neuritis is shown by the tenderness of nerve trunks, the spontaneous, often severe, pain, and the trophic changes, both in the skin and the muscles—the glossy skin and atrophied muscles.

Neuro-retinitis is also met with in the gouty. Commonly, of course, it occurs in association with albuminuria, yet it is met with, apart from this, even in cases where no very obvious cardio-vascular changes can be demonstrated in other regions. And thrombosis in retinal veins, apart from cardiac hypertrophy and demonstrable changes in arteries or blood pressure, is of frequent occurrence. In such cases gout is probably—in many instances demonstrably—a very important factor in the ætiology.

Neuralgia also is common in the gouty. Its most common form is that in which the fifth nerve is affected, and it is sometimes very severe. Migraine also seems, in many cases, to be related to gout, and to be much modified in its severity by dietetic modifications. The psychical condition sometimes attending gout may also be briefly alluded to. Depression is common, irritability the rule. Symptoms of excitement, even maniacal symptoms, may come on before, during, or after an

attack of gout ; and true epilepsy, it is said, may also manifest itself as an actual result of the attack. Melancholia is not an infrequent sequel to glycosuria, especially if the glycosuria have gone on to true diabetes. And such a sequel, it may be said, is especially apt to occur in members of the Jewish race.

There is a condition of nervous disorder which occurs sometimes in patients in whom actual gouty symptoms exist, or in whom they have been present ; sometimes in those in whom no such obtrusive manifestations of gout have shown themselves. In these patients there is established, often between 50 and 60 years of age, a condition of premature senility, with, at times, evidence of local brain changes. Thus, a patient may have some degree of speech and articulatory difficulty without any sign of paralysis of limbs, and these may be associated with considerable mental deterioration—loss of memory, of power of concentration, and the presence of a great tendency to emotional instability. Such changes are no doubt the result of vascular degeneration, and consequent imperfect blood supply to the brain. They may persist during several years, and the mental change varies considerably in degree at different times, so much so indeed, that I have known such a condition, on more than one occasion, mistaken for, and treated as if it were, hysteria. Such a condition usually occurs in patients with gouty manifestations, and not infrequently in those in whom there have been recurrent attacks of acute gout. There may be present signs indicative of cirrhosis of the kidney, yet in some instances such signs are completely absent.



## THE CUTANEOUS MANIFESTATIONS OF GOUT AND THEIR TREATMENT.

By JAMES GALLOWAY, M.D., F.R.C.P.,

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WHAT causes surprise is not that outbursts of disease of the skin do appear in gouty persons, but that they are not of much more frequent occurrence. It is a matter of everyday experience that the ingestion and imperfect digestion of certain forms of food produce manifestations in the skin of acute and usually evanescent character, such as urticaria and erythema multiforme. We may also consider the fact to be established that diseases of certain of the internal viscera, for instance, cirrhosis of the liver, are attended with eruptions on the skin, such as erythema exudativum and purpura, due to the existence in the circulation of noxious substances resulting from the disordered functions of the diseased organs. The delicately constituted circulatory apparatus of the skin, so easily affected by central and peripheral nervous influences, and so liable to mechanical injuries, affords a ready explanation of such phenomena. It is therefore not to be wondered at that the prolonged ill-health associated with gout, and the fact that unusual substances are found in the blood of gouty persons, should have been considered to be strong evidence in favour of the opinion of those physicians who ascribed almost all varieties of disease of the skin to gout, nor that their views should have found wide acceptance with the public. The French school of the middle of the last century included those who most vigorously inculcated the widespread prevalence of the cutaneous manifestations of "arthritisme," but now even in France the all-pervading influence of gout in the causation of diseases of the skin is no longer held even as a working hypothesis. Dr. L. Jacquet, with the kindly appreciation of the hypotheses of Bazin which is to be expected, writes, "*Le lien admis entre le groupe de maladies dites arthritiques est très mal connu dans son essence, mais il serait tout aussi contraire à l'esprit scientifique de le nier avec rigueur que de l'affirmer avec présomption.*"

In this country, also, we have gradually become more



discriminating in the ætiology of diseases of the skin.

The errors of metabolism, which bring about as one result the true gouty arthritis, are associated with periods of imperfect nutrition, of which evidences are various forms of dyspepsia, and nervous and physical depression. Later on the gouty diathesis becomes more firmly established, and changes in the blood vessels, heart, and kidneys become the most important feature in the disease. The skin manifestations of gout also fall into two main groups, those associated with the early periods in which the errors of metabolism are most in evidence, and those which occur in association with the period of arterio-sclerotic change.

In the earlier stages of the disease there occurs in many of the sufferers a pruriginous scaliness of the skin which shows itself mainly on the extremities, especially in such positions as the extensor surfaces of the arms and legs, and the back of the neck. The itching, which is a troublesome feature of this stage, provokes rubbing and scratching of the affected region, and very soon a dermatitis is produced which rapidly assumes the appearance of eczema. The first stage in this process is in all probability due to defective blood supply to the cutaneous surfaces. The vascular areas of the skin and the epidermis are in consequence ill-nourished. The upper layers of the epithelium are badly formed and desquamate, a condition usually associated with pruritus. On account of the scratching and rubbing which the patient finds difficult to avoid, abrasions of the surface are produced. The micro-organisms constantly present in the epidermis increase in numbers, and other micro-organisms, possibly of greater degrees of virulence, or with definite pyogenic properties, are engrafted. Thus it is that the true eczema of the gouty is established.

The patient who comes to us with this type of skin affection is characteristically the man of active habits who has been accustomed in early life to a large amount of muscular exercise in the open air. His career, or the pressure of work as he becomes older, prevents his taking the exercise to which he has been accustomed. He is in good health, vigorous, retains a good appetite and continues the dietary which suited him in early days. It does not occur to him that it is necessary to limit himself in his new circumstances either in diet, in the

consumption of alcoholic beverages, or tobacco. For some time, it may even be for years, he feels no evil consequences, but if the different factors in the problem remain unaltered sooner or later the result is produced. He finds that he is no longer so light of heart as was his wont. His periods of joyousness are apt to be succeeded by bouts of depression, and with feelings of dyspeptic discomfort. The latter symptoms draw his attention especially to the condition of his digestion, and very likely he proceeds to make various alterations in his dietary, usually changing one form of alcoholic beverage for some other which he thinks suits him better. He then finds that he has got into the way of rubbing the backs of his forearms or scratching his legs and outer surfaces of the thighs after his morning bath or in bed, or again he notices that his collars chafe his neck very readily. To his disgust he finds one morning that he has a red, scaly patch on one or other of these situations. He flies to his doctor, displays the offending spot, and proceeds to give some special explanation of his trouble, and especially how little he deserves this visitation.

On the other hand he may conceal his woes. He goes on scratching till at length the discomfort of an œdematous or weeping skin, or the objurgations of his family drive him to his medical attendant. He has now developed what our predecessors called "chronic gouty eczema."

The most reasonable plan for preventing and curing this condition is in the first instance by the proper instruction of the patient; when the opportunity offers, individuals with gouty tendencies, or who have already displayed evidences of gout, should be warned that care must be taken to prevent these evil consequences. The early stages of dryness and itching of extensor surfaces should be noted and pointed out as a forerunner or troublesome disease of the skin. In the second instance it is a matter of the greatest importance to arrange a suitable dietary. The vigorous man, who in the course of years is compelled to live a sedentary, or perhaps a confined life in a city, must be warned that the full diet which he has been accustomed to take in earlier days is no longer suitable. It requires to be limited both in quantity and in quality. The main criterion of success in dietetic treat-

ment is that the patient no longer suffers from feelings of repletion, dulness, or sleepiness after meals, and the chief method is restraint of the appetite during meals. To most patients diet containing a fair amount of proteid is permissible, while the amount of carbohydrates should be limited. All alcoholic beverages are better avoided. The necessity to such patients of exercise, and especially exercise in the open air, can hardly be insisted on too strongly. In most cases, if properly arranged, exercise in itself is sufficient to hold these troublesome symptoms in check. One of the most satisfactory things to witness is the relief resulting from a holiday in the country in the case of the patient commencing to suffer from gouty symptoms with pruriginous disease of the skin. He leaves town dyspeptic, depressed; with patches of eczema on the back of the forearms or on the front of the shins. If he uses his holiday properly, he comes back relieved in body and mind, and shows his doctor the previously inflamed surfaces free of eruption and covered with smooth epithelium.

Medicinal treatment is fortunately of much value in producing relief. This field of treatment has given rise to, perhaps, some of the most successful incursions of the quack doctor into the field of medicine. The cause of this disease is to such a large extent dependant on the rubbing and scratching of pruriginous surfaces that many anti-pruritic remedies, usually also possessing antiseptic properties, are of value. The consequence is that in olden days many resinous or tarry preparations, and later substances derived synthetically, especially of the carbolic acid series, have been exploited by the "advertising doctor," or the newer "drug companies," as infallible remedies in the treatment of eczema. The experience of the profession gathered through many generations teaches us the risk of applying drugs of this class to the skin, but their worth in certain cases has long been recognised and appreciated as a valuable asset by all of us. Occasionally, however, prudence, or want of full knowledge, stands in the way of their administration. The long-suffering patient by accident uses one of these remedies, and experiences immediate relief of irritation—a relief which often precedes the definite cure. With a long-enduring grudge against the doctors who have failed, the thankful patient advertises himself (or herself) as evidence of the efficacy of the new remedy, and



helps in making the fortune of the unscrupulous drug-monger ; but anyone with large experience knows only too well that for one case in which remedies of this class are suitable there are ten in which, especially when ignorantly applied, the condition is infinitely aggravated.

The most reasonable scheme of local treatment in cases with increasing dermatitis in gouty patients is to protect the threatened surfaces against all accidental irritants, and, most difficult of all, against the assaults of the patient himself. For this purpose a long array of protective bandages and dressings is available. The most effective are of two classes :—first, the group of preparations with zinc gelatine as their basis ; second, various pastes and varnishes, soluble in water, in which mucilages, especially of tragacanth, form the basis. Many cases require no further local remedy than to be covered by a glyco-gelatine of zinc of suitable consistence. On the extremities this is especially suitable ; on other parts of the body its useful properties cannot be so well utilised. When applied to the neck, for instance, under the clothing, it is apt to become soft, and is rubbed from the surface unless used of such a firm consistence as to be hard, inelastic, and irritating. In other situations, such as the groin, the inner surfaces of the thigh, or the lower surfaces of the abdomen, its use is impossible. The tragacanth pastes and allied preparations are often of much service ; on the neck, for example, when properly applied, they form clean coverings, protecting the inflamed skin, which heals under the application. Dressings of both classes are readily medicated in various ways, and with them can often be combined with advantage drugs with simple anti-pruritic properties. It is obvious that every precaution must be taken to prevent irritation of the inflamed surfaces by clothing, using loose, soft collars, properly made sleeves, stockings, etc. The very fact that trouble has been taken by the patient or by his medical attendant in preparing such a permanent dressing gives the patient sufficient moral support to keep his hands off.

As a rule the use of ointments and of lotions should be avoided. Their value in certain conditions is of course admitted, but they have the unfortunate tendency to soften, and even to macerate, the skin, and by their fluid consistence they inevitably tend to spread irritating and septic discharges. A non-irritating dusting powder free from starch may be applied with

advantage round the inflamed surface ; it will serve to control pruritus and to avoid maceration. The necessary washing of the skin in persons thus affected should always be carried out with a certain amount of ceremony and care. Cleanliness is absolutely necessary ; friction is dangerous. There are now several trustworthy neutral soaps which may be recommended as safe for patients to use ; if soap cannot be tolerated, cleansing of the surfaces by means of barley water or bran water is possible with the minimum of risk from irritation.

In the second line of treatment comes prominently the class of drugs to which allusion has already been made, namely, those with anti-pruritic properties. Their name is legion ; of the tar preparations, the oil of cade, the oleum betulæ albæ, and purified coal-tar are of much value. Of the carbolic acid series, carbolic acid itself, resorcin, and salicylic acid may be mentioned. The use of one or other of these remedies at the appropriate time will often serve to clear up an attack of pruriginous dermatitis of the type alluded to when the simpler protective methods of treatment are slow in their action, or may appear to the patient to have lost their effect.

The following prescription, dispensed by one of our most trustworthy firms of druggists, gives an indication of the type of remedy which has been so much exploited by advertising companies :—

|   |                 |   |   |   |           |
|---|-----------------|---|---|---|-----------|
| R | Resorcin        | - | - | - | gr. xxiv. |
|   | Ung. Zinci      | - | - | - | ℥ss.      |
|   | Ung. Calamininæ | - | - | - | ℥ss.      |
|   | Ol. Cadini      | - | - | - | ʒi.       |
|   | Ol. Lavandulæ   | - | - | - | m. v.     |
|   | Ol. Geranii     | - | - | - | m. ii.    |

M. Ft. unguentum.

It is to preparations of this type, varying in strength, as well as to the actual anti-pruritics used, that so many of the vaunted magical cures of eczema are due. We often hear bitter complaints respecting the unscrupulous tactics of the advertiser, and the unsympathetic attitude of the happily cured patient. The disappointed doctor, however, may lay the flattering unction to his soul that for every patient cured by such preparations many more are made worse, and that these unfortunates will consult him by-and-by.

The diseases of the skin which occur in the later and more

advanced stages of gout are more closely related with the cardio-vascular and renal changes with which the disease is associated. They are, however, so important that they must receive notice however short. These later skin manifestations may be roughly classified as follows:—

*First.* When in addition to purely gouty manifestations there occurs slight albuminuria, giving evidence of cirrhosis of the kidney and cardio-vascular change, eruptions of erythematous type are not uncommon. They are usually slight and evanescent. It is rare to find severe examples of exudative erythema in this stage of the disease.

*Second.* More important, and occurring usually when renal and vascular degenerations are more pronounced, are affections of the skin characterised by exfoliation of the epidermis. Slight pityriasis is not uncommon, but should always be treated with care. Occasionally there occurs general exfoliative dermatitis; and the combination of this disease of the skin with renal changes gives rise to a most serious condition. The experience of most observers is that the combination of true exfoliative dermatitis with definite renal disease presents a prospect of the utmost gravity. Fortunately general exfoliative dermatitis is rare, but it becomes the more necessary to deal carefully with any desquamative disease of the skin occurring in persons with marked gouty tendency. The chronic eczema of the gouty should be watched with special solicitude, in order to avoid the risk of the chronic eczematous state degenerating into secondary exfoliative dermatitis.

*Third.* As the result of the vascular changes, and of the blood degenerations occurring in severe cases, and in the later stages of gouty disease, eruptions of purpuric character are not uncommon; sparsely scattered points of purpura are usually all that can be noted, but special attention should be paid to them as they indicate a severe degree of the vascular and renal changes produced by gout. Occasionally, fortunately rarely, there occur the more severe types of purpuric erythema. These are, however, more especially associated with acuter forms of renal inflammation and degeneration. But in the later stages of cirrhosis of the kidney of gouty origin they are known to occur. Eruptions of exudative and hæmorrhagic erythema indicate great changes in the tissues and in the blood, and the prognosis in consequence is of the utmost gravity.



BALNEOLOGICAL TREATMENT OF GOUT,  
WITH SPECIAL REFERENCE TO BATH.

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THE balneological treatment of gout forms one of the most effective methods, if not *the* most effective method, of treating this disease. But while stating this as a general rule, it must be remembered that it is only certain mineral waters which can be advantageously employed, and that many of these waters are most usefully employed in different stages of the disease and in different physical states of the patient.

Therefore, while broad lines can be laid down as to the suitability of any individual water for a particular case, many things must be taken into account besides idiosyncrasy in ordering a case to a certain spa and for a certain course of treatment. It is with the hope of assisting the medical profession in the choice of a suitable spa that I have written the following notes on the balneological treatment of gout.

It is not my intention to enter into the causation and pathology of the disease, but to assume as a fact that in gout we have to deal, in one case, with an excess of urates in the blood, and in another with a deposition of the urates in the tissues. The cause or causes of this excess is at present obscure, and it is not my intention to discuss it.

Uric acid does not exist in the blood in a free state, but may be found there in combination as a urate (quadriurate). In the normal state this is eliminated naturally, but should anything interfere with this elimination, certain changes occur which transform the soluble urate (quadriurate) into biurate of sodium, and in this form it is deposited as an insoluble crystal in the tissues. Our aim in the treatment of gout, therefore, must be, in the first instance, to diminish the tendency of the system to accumulate urates in the body-fluids, and secondly to prevent the deposit of them in the tissues as crystals of sodium biurate. Unfortunately the former tendency

is a most persistent one, and one which, although capable of modification, does not seem susceptible of any permanent and radical cure.

As it has been proved that the larger the proportion of urates present the more likely is there to be a deposition of the crystalline biurate, or, in other words, an attack of gout, it becomes necessary to lessen their percentage in the body-fluids, and it is in this that balneological treatment so largely assists.

If we bear these principles in mind, it becomes clear how the various mineral waters may help, and in what way their effect may be looked for. The *rationale* of mineral-water, in fact, becomes clear.

As may be judged from the foregoing, the gouty diathesis is quite as important to treat as gout itself, for if we can prevent an excessive quantity of urates accumulating in a person known to have a tendency to gout, it is quite conceivable that actual deposition of the biurate crystals may be prevented, or at least postponed for a great length of time. It is, therefore, of importance to remember that balneological treatment must be repeated at suitable intervals, according to the case, and that, in no case, can one or two courses of waters be looked upon as likely to produce a permanent cure. From the nature of the disease this cannot be; but I wish to emphasise the fact, as one so often finds grave disappointment in those who, having once undergone a course of treatment at a spa, think they have done all that is required to keep them free for the rest of their lives. My experience is that when once the formation of an excess of urates has begun, there is a constant fight between the prophylactic and eliminative measures adopted and the formative tendency on the part of the body, and in nine cases out of ten the latter wins.

The two points in treatment to be arrived at are therefore :  
(1) The prevention of the excessive formation of urates; and  
(2) if the excessive formation has occurred, the elimination of the excess.

At spas our principal aim is to assist in preventing this excessive formation, by superintending and inculcating certain rules as to exercise, diet, mode of life, and personal hygiene. Should excessive formation or deposition in the tissues have

occurred, we can, by prescribing certain waters to be drunk and bathed in, assist the elimination of the excess of urates, and diminish, by flushing out the system, the percentage existing in the body-fluids.

Gout presents itself in many and various guises, and in practically all of them balneological treatment is of use. It may occur as regular or irregular gout, and in every gradation of acute or chronic form. It may be seen as an acute paroxysm affecting one or more joints, with or without deposits in the cartilages and fibrous structures of the articulation. It may be chronic with deposits in and about the joint-structures, in the ligaments, tendons, and subcutaneous tissues, tendinous sheaths and bursæ, causing much enlargement, crippling, and deformity. It may be seen in irregular forms which may implicate practically every function and system of the body. These irregular forms may be related, but frequently they have no relationship to the more regular attacks, and patients suffering from them may never have a regular gouty paroxysm. The principal systems affected may be the circulatory, nervous, urinary, and respiratory; while the skin also may frequently be affected, as may be the eye. It is thus seen that, in dealing with gout, we have a disease which may give rise to almost any symptom, and affect almost any organ or function.

Bearing all this in mind, and the nature of the disease, it becomes a question what to do with each individual case, and what method of treatment to recommend. In practically all cases, sooner or later, it is decided that a course of balneological treatment is necessary, and one is often asked whether drinking the waters at home will not do. Theoretically it should, but we must not forget that drinking the waters is only part of the cure. The waters at most spas are also applied externally as baths and various kinds of douches, which may be supplemented and assisted by packs, passive movements, and massage, electricity, radiant heat, etc. Moreover, in getting away from home and in taking a holiday, the daily worries are to a great extent left behind, and the patient has the advantage of change of air and scene, superintendence of his diet and mode of life, and plenty of opportunities for outdoor exercise. Another great point in going to a spa is that it would not be possible for anyone going about their ordinary avocations to



drink large quantities of water every day at stated intervals nor to submit to a series of baths of a more or less trying character. Such a course at any time throws a great strain on the system, and is, without doubt, best carried out at a spa, where all the concomitant advantages can also be secured. Empirically we know that gouty persons derive great benefit from a course of mineral-water treatment, for it is a daily observation that patients, afflicted with all forms of the disease, go to spas, and return from them either cured or else greatly improved—and this in cases which may have undergone much other treatment with no result. We cannot ignore this, and those of us who have much experience of gouty conditions recognise that balneological treatment in some cases is absolutely essential and in all cases desirable.

To explain scientifically how mineral waters produce such great and good effects is more difficult. The therapeutic action in drinking any mineral water is dependent partly on the quantity of water taken, partly on the character and quantity of its chief chemical constituents, and partly on its temperature. Hot mineral waters act, as far as we know, in the following way. They act to a certain extent by the effect of their constituents, which are rapidly absorbed from the intestinal canal, on many of the glands, such as the pancreas, liver, kidneys, etc., as solvents of various pathological and chemical elements found in the body; as diluents flushing and washing out effete material; as anti-fermentative agents; while, by causing a certain over-saturation of many tissues, and, by stimulating the heart's action, they have a decided effect on tissue-changes. Some of these effects are due to the chemical composition of the waters, some to the mere fact of their being hot water given in quantity, and some to other and unknown qualities. At the same time this does not seem to me to quite explain the action of mineral waters in gout. And one must take into consideration the question of radio-activity and the ionic or electrical dissociation theory. Our present knowledge of these, unfortunately, is too elementary to allow us to do more than note that mineral waters possess some property or properties not found in ordinary drinking water.

When used as a bath, mineral water apparently is not absorbed. The clinical results of immersion in the case of a

chlorotic girl prompts one to declare that absorption must occur, but chemical tests declare against it. Bencke and Rohrig have proved that in brine-baths no increase of sodium chloride is excreted by the kidneys, and what is true of this salt must be equally true of other salts. The general consensus of opinion is undoubtedly in favour of non-absorption. Nevertheless it is accepted as true that the skin is capable of absorbing substances that are volatile in the form of gas and vapour. Rohrig proved, by applying finely pulverised water to the skin by force of rubbing, that some absorption took place into the corium, and this of course must be borne in mind when douches accompanied by massage are prescribed. Physiologically, hot baths produce an initial vaso-constriction, which quickly passes off, and gives place to a vaso-dilatation, which lasts during the rest of the immersion and then slowly passes off. This superficial vaso-dilatation is associated with an increase in perspiration and in the frequency of respiration. The whole constitutes the reaction of the body to heat, and as can be seen, the animal mechanism increases the loss of heat to counteract the heating effects of the application. Owing to superficial vaso-dilatation more heat radiates from the body; by increased perspiration the loss of heat by evaporation is augmented; and by increased respiration more heat is given off, and watery vapour expired. In addition, local sedative action on the sensory nerves occurs, which, if prolonged, causes a general sedative action. At the same time the hot water acts as a mild counter-irritant, causing gentle excitation of the cuticle; and this effect is passed by reflex action throughout the body, and is accompanied by increased oxidation. The circulation improves and the tissues receive fresh supplies of blood to reinforce their vital powers. Hot-air and vapour-baths differ only in degree in their action, the greatest amount of perspiration being obtained by hot-air baths. A mineral-water bath, therefore, acts partly by causing increased perspiration and expiration of watery fluid from the lungs, with consequent increased imbibition of fluid and flushing of the body-channels, also by its sedative action on the nervous system, and partly by its effect as a stimulant to the whole circulation. An increase in the excretion of toxic substances occurs, while distant organs and tissues are stimulated.

A fact has been stated with regard to the precipitation of urates in the laboratory, namely, that the larger the proportion of sodium-salts in the medium the greater is the tendency to precipitation. This is curious, for the prevailing idea has been that, although not so beneficial as some other alkaline salts, yet sodium-salts were, to a great extent, of use in the treatment of gout. It has also been remarked that those tissues which are most liable to deposits are those most rich in sodium-salts, and that those tissues which are least rich are least liable. Thus cartilages and fibrous tissue contain 0.90 and 0.70, respectively, per cent. of sodium-salts, as compared with 0.08 per cent. in muscle. On the other hand, Pfeiffer says the best results (clinically) are got with those waters which contain the largest amount of sodium bicarbonate (Fachengen water). If the laboratory results can be substantiated in the body, a remarkable change must occur in our ideas as to the benefit to be derived from certain mineral waters which have been largely used in the treatment of gout.

At many spas one is familiar with the fact that the first effect of treatment may be to bring on an acute gouty paroxysm, which is looked on, in most cases, as being beneficial, for by its means the excess of urates is removed from the body-fluids and deposited in the tissues. This method of cure, being accompanied by much pain and some danger, hardly recommends itself to the thinking physician. It is held that this gouty paroxysm is brought about by the presence of sodium or its salts in the mineral waters drunk, but I have more than a suspicion that these acute attacks are brought on more by the thermal action of the mineral waters, when used externally, and may be regarded more or less as traumatic, than by the action of any of their chemical constituents. This is my impression only, for I cannot call to mind any case that has developed an acute attack on drinking the waters, whereas I remember several attacks which came on only from bathing, the bath being either a simple warm immersion or a vapour-bath. Of course these attacks may have been coincidences, but I have seen them apparently determined by plain hot-water baths in those who were having no mineral-water treatment at all, and we are all familiar with the fact that soda added to a local bath apparently adds



to its sedative action. However, these are points which at present must be left alone. The alkaline and saline waters are usually regarded as giving the best results in gout, as it is thought that the administration of the alkaline carbonates increases the elimination of the urates. In the majority of waters which contain little or no soda we find the mineral constituents to consist chiefly of the carbonate or sulphate of lime, and, as lime-salts are, to a great extent, not absorbed into the blood, but pass out of the body without any action, it follows that these mineral waters mainly depend for their action on being drunk freely on an empty stomach or for their radio-activity.

In considering the clinical results at the different spas we find that in the robust and corpulent the waters of Carlsbad and Marienbad do much good, especially in association with the strict dietetic regimen carried out at these spas. These waters contain large quantities of sodium sulphate, bicarbonate and chloride ; hence it is possible that any good derived may be ascribed more to the dietetic regimen, combined with the flushing and thermal actions of the waters, than to any inherent properties of the waters themselves. In many cases distinct harm is done, at these spas, to old people, from a too prolonged course. Again, Vichy, which is a simple alkaline hot water, does much good in the robust cases, but it is not adapted for the weakly and anæmic. The waters of Vals have much the same effect : they contain a very large proportion of sodium carbonate. Of the muriated saline waters those of Harrogate and Homburg are much used in sluggish action of the bowels with portal vensosity and congestion of the abdominal organs. The sulphur-waters act as cholagogues, thus relieving portal vensosity, and are most suitable in gout associated with such a condition. The class of waters which may most suitably be used in all forms of gout appears to belong to the simple thermal or calcareous waters. As most of these contain no sodium, or, at most, traces of it, theoretically they should give the best results, and many have a high and increasing reputation — amongst them are, in this country, the waters of Bath, Buxton, and Strathpeffer ; in France, the waters of Contrexéville, Vittel, Aix-les-Bains and Barèges ; and in Germany, the waters of Wildbad, Gastein, Pfeffers,

and the Sauerling spring at Carlsbad. Taken internally these waters tend to retard or prevent the deposition of the urates. They act on the intestinal mucous membrane as antacids and as slight astringents ; and, if taken freely on an empty stomach, they assist the elimination of urates by diluting the blood, and by lowering the percentage present in it. They stimulate the kidneys and relieve the pressure on their excreting powers. Many of them have a great reputation in relieving bladder-irritation and in lessening a tendency to gravel or stone. They are specially suitable in cases of gout amongst the weakly.

Roughly speaking, one can balance certain advantages and disadvantages of the various classes of waters, bearing in mind that, as far as possible, those containing sodium should not be used, if one not containing it can be found to fulfil the other requirements of each individual case. I would therefore in all cases of gout, not associated with marked portal vensosity, or the full habit, strongly recommend Bath, Buxton, Strathpeffer, Contrexéville, Vittel, Aix-les-Bains, Barège, Wildbad, Gastein, and Pfeffers. Should there be much abdominal congestion, with a sluggish liver, it may be considered preferable to send the case to Carlsbad, Marienbad, Tarasp, Elster, Brides-les-Bains, or Franzenbad, or to the slightly less powerful waters of Uriage, Bagnères de Luchon, La Bourboule, Royat, Kissengen, Wiesbaden, or Baden Baden. In delicate cases Ragatz, Teplitz, and Schlangenbad are of use. In America, the most suitable waters are the waters of Saratoga, St. Clair Spring in Michigan, and Caledonian Spring in Canada. These last are alkaline saline waters.

Special complications may require special treatment. Thus gravel and stone receive special benefit at Contrexéville or Vittel, or if associated with portal vensosity, at Carlsbad. Gouty glycosuria is supposed to derive special benefit at Vichy and Neuenahr, but, from my experience, most mineral waters, generally suitable for the gouty, act as well if associated with proper dietetic supervision. Nervous complications are undoubtedly most benefited at the milder spas, especially the simple thermal ones. If associated with eruptions of the skin the simple thermal or alkaline waters are of much use, as are the sulphur-springs of Harrogate, Strathpeffer,

and Aix-la-Chapelle. Some of the mud-baths have also great apparent influence.

The actual application of the waters may now be considered. As I am most familiar with the methods carried out at Bath, I will describe the modes of application as carried out there; and it will be found that practically all the best features of treatment elsewhere have been adopted at Bath, while in some cases the technique has been improved upon.

There are two methods of applying the waters, (1) internally, and (2) externally.

*Internally* the principal use is to drink them, and they may either be drunk as part of a course, with which are associated baths, douches, and other forms of local treatment; or they may form a course by themselves. There are many cases which cannot be bathed for a variety of causes, but which may derive much permanent as well as temporary benefit by simply drinking the waters. The Bath waters, when fresh, are clear and sparkling, without odour, and with a slightly saline chalybeate taste, in nowise unpleasant, and after a time distinctly agreeable. The quantity to be drunk should be divided into two portions, one to be taken early in the day, before breakfast, if possible, and the other an hour before lunch or early in the afternoon. In the more robust cases the "before breakfast" glass should always be insisted upon, but with the more delicate this is often impracticable, especially as so many of our cases undergo treatment in the winter months. In any case the water must be taken on an empty stomach. Sometimes the waters are ordered in very large doses, as much as three quarts being given daily, with the result that they act as a purgative. In small doses they tend to constipate slightly. To begin with, the dose should not exceed 4 oz. to 6 oz. at a time, and it should be gradually increased until the full quantity is reached. This, for men, is seldom more than 30 ozs., and for women 20 ozs. To obtain the full benefit the water must be sipped slowly, and gentle exercise must be taken after each dose. At the Grand Pump Room the water is served at a temperature of  $114^{\circ}$  F., but in gouty patients more benefit is obtained by raising the temperature of the waters considerably. This is done at the Hetling Pump Room by passing the water over a steam coil, which



raises its temperature to as much as 150° F., without any admixture or interference with its inherent properties. It has been found that by thus raising the temperature of the water no chemical alteration takes place. The clinical effect of this superheated water is to wash out and dissolve the contents of the stomach, bile-ducts, and upper portions of the small intestines, much more rapidly than occurs when the cooler water at the Grand Pump Room is employed. The immediate effects of the waters, when thus exhibited, are a glow of warmth in the stomach, an increased appetite, an improvement of the spirits, an augmentation of the saliva, and an increased secretion of urine—this last constituting one of the best indications. They also tend greatly to quench thirst. If, however, the water produces headache, thirst, a dry tongue, and a sense of weight in the stomach, or diminishes rather than improves the appetite, and induces nausea and sickness without any increase in the urinary flow, then it is doing no good. To remedy these symptoms all that may be necessary is to diminish the dose and to alter the temperature and the period of the day at which it is taken. Possibly some diuretic taken conjointly with the waters may help, but should they all fail, for a time at least, the use of the waters must be abandoned, as no benefit sufficient to counterbalance the discomfort experienced is likely to be derived. In certain conditions, such as gouty vesical irritation, drinking the water cold is often most beneficial. It can be obtained cold by simply allowing it to stand, but in this case, it will be found to have lost its volatile constituents, and to depend for its action principally on its large proportion of calcium sulphate. In those cases where there is marked portal venosity the Bath waters may be much improved by the addition of some diuretic and laxative ingredient, especially in the early morning dose; the most useful additions being the crystals of citrate of lithium, of the Carlsbad Sprüdel salts, and of those of the Elizabethan spa at Homburg. As an absolute rule it may be laid down that the waters are not to be gulped down nor taken in a hurry. There is no objection to drinking the waters and taking a bath upon the same day.

The Bath waters are also administered internally by inhalation and as sprays. In gouty conditions of the larynx and

bronchi, inhalation of the vapour from the waters has been found to give much relief, but it must be administered with care. The apparatus is the same as that used at Aix, and the gases of the hot waters are inhaled as at Lippspringe. In the "umbrella" room at Bath the hot mineral water gives off its vapour until it fills the room in which the patient sits. The latter at every breath fills his lungs with the vapour, often with marked benefit. After the application great care is required to prevent a chill, and, for this reason, the employment of this form of treatment has been somewhat neglected. With care I have seen much good done. In gouty pharyngeal troubles sprays are also applied, the apparatus used being Siegle's spray, which can be used for hot or cold sprays, with or without the addition of chemical products. Personally I only order the natural waters and always find much good from their use.

From statistics I find that gout, in all its various forms, may be successfully treated by the Bath waters. At the Royal Mineral Water Hospital, over a period of 10 years, 13.9 per cent. of the gouty cases were cured, and 80.7 per cent. were relieved. In taking the percentage of all diseases treated at the hospital, only 10 per cent. were cured, and about 65 per cent. relieved. Therefore the gouty cases show a very good percentage. Under the term "relieved," many leave the hospital quite free from all pain, but, owing to the somewhat strict definition of "cured," they could not be included in that category. In treating gout it is found that a course of treatment tends to remove the various disorders which stand in a more or less close degree of relationship to the actual gouty manifestations, either as antecedents or concomitants, such as gastric irregularities, gastric and intestinal catarrh, acidity, constipation, portal congestion, and urinary disorders. Secondarily to the general state are the local changes, such as deposits in and around the joints (chalk stones), together with inflammatory thickening of the tissues and the consequent articular stiffness, dislocations, contraction of tendons, etc. The mineral waters exert a powerful influence in promoting absorption of these morbid products, whether applied locally or to the body generally, according to the case.

*Externally* the waters may be applied in various ways.

During the actual gouty paroxysm little can be done by

baths beyond the use of the Berthollet Natural Vapour bath to aid the general and internal treatment ; but, during the intervals between the paroxysms, much can be done in the way of baths, douches, massage, etc., to effect a cure. As a rule, in the more robust patients, immersion-baths, with or without under-current douches, or possibly vapour-baths followed by hot douches and packs, are indicated ; whereas in the atonic form, the milder reclining bath only is used, with the occasional use of local vapour-baths, with possibly massage. It must be remembered that in gout massage has to be used with care. In many cases it may be applied to all parts except those in which the gouty deposit exists, whereas in others it may be applied even to the parts affected. During an acute attack it should not be employed. In the more chronic forms, besides vapour-baths, deep and reclining immersion-baths, douches with or without massage, and electricity in many of its forms, are of great use. In gouty cases associated with nerve-pain the more sedative baths only must be used, such as the Bouillon or plain deep or reclining bath, and without or with electricity. Stimulating douches and massage almost invariably do harm. Associated with a course of baths sometimes much good is got from a few hot-air baths, either general or local ; and, where there is much nerve-pain, the reclining bath associated with electricity may sometimes act in a marvellous way.

As a general rule, the more vigorous the patient the more energetic may the treatment be. Thus the length of immersion may be greater, as may be the temperature, and the heat and time of the pack. It must be remembered that the baths which produce most perspiration are those most trying to the constitution. In prescribing baths no hard-and-fast rules can be laid down, but each case must be judged on its merits.

In the case of nervous subjects or great invalids, it is well to have a servant in attendance, to remain in the dressing-room, if not in the bath-room. An attendant can always be arranged for, but, as the bath-attendants are always busy, it is usually preferable that the patients should, when necessary, bring their own servants to assist with the dressing. At all times a bath should be entered slowly, the water being laved over the upper part of the body before the person is fully immersed. In this



way the shock, which would otherwise occur, is lessened. This shock is momentary, and a matter of mere physiological interest. It is found that by wearing a cold towel round the head any tendency to headache is lessened.

When the bottom of the bath is reached the patient should at once sit down on the sedilia provided for the purpose. After the bath there should be a consciousness of increased elasticity and vigour of body, and no feeling of faintness. When attended by marked redness of the skin, flushing of the face, throbbing of the temples and giddiness, the temperature of the bath should be lowered and the duration of the immersion diminished, until in fact both are adapted to the requirements of the case. If, after taking these precautions, similar effects still continue, it will be evident that the use of the baths must be temporarily abandoned.

The temperature of the bath is a matter of great importance. The first two or three baths should be taken at a temperature varying between  $96^{\circ}$  and  $99^{\circ}$  F., preferably the latter. If no ill effect arises, the heat may be gradually raised to  $100^{\circ}$  or  $101^{\circ}$  F. More rarely to  $103^{\circ}$  or  $104^{\circ}$ . In no case should the latter temperatures be employed without special direction. Experience has proved that more benefit is derived by a continuance of the baths at moderate temperatures than by a short course at higher ranges.

The time for remaining in a bath varies according to the case; ten minutes is a good time to start with, but many full-blooded patients find five minutes long enough for a first bath. As the patient gets accustomed to the treatment the period may be extended to fifteen or twenty minutes, more rarely for longer periods.

After leaving the bath, the patient, in the majority of cases, will be packed in warm sheets and towels, and left to repose on a couch in the dressing-room for a period varying from five to twenty minutes. The temperature of the pack and the tightness with which the towels are applied varies with the case—the more robust having it hotter, tighter, and for longer than the more delicate. After the time ordered the wraps are laid aside one by one, and dressing is slowly proceeded with. It is not, as a rule, desir-

able for free perspiration to take place after the pack, so that dressing must proceed leisurely; and before leaving the bathing establishment the patient should remain for twenty or thirty minutes in one of the cooling-rooms provided for that purpose.

After leaving a bath, it is advisable that all patients should return home at once in a covered conveyance, and lie down, well covered up, for an hour or more. The best time for a bath is probably in the morning, but many prefer the afternoon, as they are then enabled to take more exercise. Any hour will suit, so long as it is not too near a meal-time. Under ordinary circumstances three or four baths a week is the usual course. From three to five weeks may be considered a fair duration for the treatment. A short course of less than eight baths is probably pure waste of time, and, by failing to effect a cure in a gouty condition which has probably lasted for years, is apt to bring the waters into disrepute; whereas a steady continuance of their use would, in the majority of cases, give a satisfactory result.

Improvement is often slow in manifesting itself, in the more chronic cases especially, and some patients even do not derive the full advantages of the treatment till a considerable time after its discontinuance.

In most cases the use of the waters should be persevered with, in annual or bi-annual courses, for they tend greatly to retard the natural progress of the disease, and, in many cases, keep the patient entirely free from any gouty manifestations from year's end to year's end—a result probably unattainable by any other form of treatment.

The more common forms of baths employed at Bath for gouty conditions are :—

(1) *The Deep Baths*, which are situated in rooms from 12 to 14 feet long, 8 feet wide, and 11 feet high, and each bath occupies the greater part of the room. Each bath is T-shaped and lined throughout with tiles. Each contains from 800 to 900 gallons of water, with an average depth of about 4 feet 6 inches. The baths are large enough to enable patients to move about, and rings are fixed in the walls for them to hold on to. Should they desire to sit down there are seats all round the sides. The patient descends into the bath by a

small flight of steps with rails on either side. Whilst in the bath the patient is almost entirely under water. Should he be unable to walk down the steps, a wooden armchair can be swung from the dressing-room door over the bath, and lowered into it. The whole apparatus, which is most perfectly under control, is worked by hydraulic pressure. Deep baths are usually given at a temperature of from  $96^{\circ}$  to  $102^{\circ}$  F., for from ten to twenty-five minutes. With this bath is often associated an under-current douche. This is applied after the bather has already been in the bath for some time. The douche is usually turned on during the last five or seven minutes of the bath, at a temperature of from  $100^{\circ}$  to  $107^{\circ}$ , and is delivered through a tube with a nozzle, and, as the water passes through a "mixer" before reaching the hose, its temperature and force can be most accurately regulated. It is directed from a short distance on to the part to be douched at varying pressures. It is most applicable to chronic local gouty affections of the joints, and nothing can exceed the relief and comfort which such applications afford. The resistance of the water of the bath necessarily breaks the impact force of the douche, but the douche can be regulated so as to give the required pressure.

(2) *The Reclining Baths*, which contain about 150 gallons of water, are provided with a hose and nozzle, so that an under-current douche can be employed. They are usually employed for those who cannot tolerate a deep bath and may be combined with the under-current douche or with massage. It has been found that a certain number of patients cannot bear the force and volume of the Aix sprays, and in those cases massage in the reclining bath is of much service.

(3) *The Massage Douche Baths* (Aix and Vichy systems) are used principally in the intervals between the gouty paroxysms or where there is much stiffness left after an acute attack. I never order them where there is any chance of setting up fresh mischief, or where there is still considerable gouty deposit. The baths are administered in rooms 13 feet 9 inches long by 10 feet 6 inches wide, with high roofs and tiled walls. Douches, sprays, and showers are arranged all round the rooms, and there is a double water-supply to each, consisting of hot and cold mineral water, so that the temperature can be accurately regulated by means



of the "mixer." By this means also the strength of the douches and sprays is regulated. The furniture consists of a wooden table, chair, and stool, all of which are sprayed with hot water before use. During the bath the floor is covered with a layer of water 4 inches deep. If two attendants are present, each douches the patient with water at the temperature prescribed (usually  $99^{\circ}$  to  $107^{\circ}$  F.), whilst applying massage. If only one masseur is ordered, a stream of water is passed through a large rose, and plays over the back or chest of the patient, while the masseur is applying massage. The duration of the bath is usually for from 12 to 15 minutes. Towards the end the temperature may be gradually lowered, and the patient may have a cool shower- or needle-bath. After it is over the patient is packed.

(4) *The Needle-baths* or "*douches en cercle*" produce a markedly bracing effect, and are usually employed with some other form of bath; they are most useful in nerve-cases, or where there is marked debility. They are applied through six rows of pipes with perforations  $1\frac{1}{2}$  inches apart, which are so fine that, with a 2-inch service pipe, five jets cover an area of 8 feet 6 inches. The whole of the body can thus receive the spray at the same time, and the temperature can be simultaneously raised or lowered. Alternating jets of hot or cool water can also be administered.

(5) *Local sprays*, or dry douches, are usually employed when it is undesirable to immerse the patient fully. By means of a hose and nozzle a current of water of varying strength, at a temperature of from  $110^{\circ}$  to  $115^{\circ}$  F., is sprayed over the part, the rest of the body being covered and kept dry. It is especially useful in chronic local conditions, or where, for some reason, a very delicate patient cannot bathe. Combined with the dry douche, one can order alternating currents of hot and cold water to be played on the patient, which have a most stimulating action on the nerves.

(6) *The Berthollet or Natural Vapour bath* may be general or local, and it can be applied with or without a shower-bath. A general vapour-bath is administered in a wooden box-shaped apparatus, in which the patient sits entirely enclosed except for the head. The bath is usually administered at a temperature of from  $100^{\circ}$  to  $114^{\circ}$ , for a period varying from 10 to

15 minutes. The local vapour-baths are administered in an ingenious apparatus, by which any part of the limbs can be submitted to the influence of the hot vapour. The temperature is often used as high as  $117^{\circ}$  for periods varying from 10 to 30 minutes. The local bath is often followed by douches, packs, and possibly massage. This form of bath is frequently used in cases of acute gout, but especially in cases of old chronic joints, and in gouty affections of the skin.

The above are the baths most frequently used in gout, but it may be found expedient also sometimes to use baths with which is associated electricity in its various forms, or possibly the Nauheim system or the radiant-heat baths may be indicated. As these systems have all been fitted up in the Bath establishment, there is no difficulty in prescribing them in suitable cases, but as a general rule their use is not called for in the treatment of gout.

Combined with the mineral waters the patient's dietary has to be carefully supervised as well as the amount of exercise necessary for each case. Dry massage, electricity, and passive movements and exercise may also be indicated, and will call for careful consideration on the part of the physician.



## THE BALNEOLOGICAL TREATMENT OF GOUT.

By W. RINGROSE GORE, M.B.,

*Llandrindod Wells.*

THERE are still many differences of opinion as to the cause of gout. Although the number of those who still hold that gout is due to an excess of uric acid in the blood is decreasing, yet they exist, and their views must be taken into consideration in a review of treatment. Personally, as the originator, I am a strong believer in the theory that gout is due to a bacterial toxin formed in the intestine, a view steadily gaining ground. With these two theories in the field there is a certain divergence of opinion as to the treatment of gout, which is perhaps more manifest in the dietary ordered to gouty patients than in the actual Spa treatment.

Whatever may be the cause of gout, it is generally admitted that the source of origin of the toxic bodies which produce its symptoms is in the gastro-intestinal canal. These bodies, whether they be actual toxins of abnormal bacterial growth, or the chemical bye-products of deficient metabolism, after they obtain entrance into the circulation, are, we believe, eliminated by the skin and kidneys, and it is upon these assumptions that the Spa treatment of gout is founded, on the one hand, to so improve the digestive functions that the production of the gouty poison is stopped at its source; on the other, to cause the elimination of this body through the skin and kidneys. These methods of treatment are complementary of each other, and successful Spa treatment depends upon the intelligent utilisation of each. To really give a proper treatment of gout, a spa should have a water or waters capable both of improving the digestive functions and of causing an increased flow of urine. I think, too, that the most successful spas for the treatment of gout are those that depend upon a fair quantity of water to be drunk to get the eliminatory action required. The elimination of the gouty poison taking place through the skin, the waters drunk usually assist this action; but, as a free action of the skin is desirable, this should be assisted by some form of bath, so that



a spa, to be correctly equipped for the treatment of gout, should have a water which when drunk will improve digestion, a diuretic water, and an adequate system of baths.

Some spas seem to rely entirely on their eliminatory methods, but although these may relieve gout for a time, they cannot have such a lasting effect as have those that combine a method of improving digestion with one of elimination. Elimination does nothing to stop the formation of the gout toxins; it could not be expected to do so. A bath cannot affect the growth of a bacillus in the intestine, but, in conjunction with other treatment, baths are of great importance. I believe that in gout there is a storing up of toxic bodies in the fibrous tissues, what might be called the backwater of the circulation. The removal of these bodies is assisted by thorough massage, which forces the circulation through the tissue spaces; by the drinking of large quantities of diuretic water, which washes them into the urine; and by baths, which cause a free action of the skin, and get rid of them in this way.

The usual routine for the treatment of gout at Llandrindod Wells, the spa I practise at, shows very well how these objects are obtained. The patient, in the morning before breakfast, drinks several glasses of the hot saline water, a chloride of sodium spring; this, entering the stomach when that organ is empty, washes it out, and, as physiologically the stomach does not absorb water, quickly passing the pylorus, washes out the upper portion of the intestinal canal; the salt increases peristalsis, and, with the quantity of water drunk, acts as a mild aperient. A great deal of the water drunk is absorbed from the intestine, and seems to be excreted by the digestive glands, as the flow of bile is increased.

The mucous membrane is stimulated, gastro-intestinal catarrh relieved, nutrition improved, and bacterial growth in the intestine is lessened; a remarkable and rapid improvement takes place in any cases in which digestion is impaired.


The second, or eliminatory part of the treatment, is commenced by drinking the diuretic sulphur water in the forenoon and afternoon, followed by those baths, combined with the massage and exercise that each individual case requires.

This is the routine treatment modified by the individual, as should always be the case in the treatment of gout. The patient

has, first, a treatment directed to stop the formation of the gout toxin at its source; secondly, a treatment to wash out of his tissues those toxins that have already accumulated there. There is one interesting test that shows that this gastro-duodenal lavage action of the morning water does have the beneficial effect claimed; in many cases of gout and gastro-duodenal catarrh indoxyl-potassium-sulphate occurs in the urine, a pathological condition found when bacterial growth takes place in the duodenum, or upper portion of the jejunum, which in health should be sterile. After the first week's treatment by the morning aperient water this indol reaction either disappears altogether, or is greatly lessened, with a consequent improvement in symptoms. This is an important test, as it shows a definite result from spa treatment, that it definitely decreases bacterial growth in the intestine.

Gout and its allied diseases comprise by far the largest number of cases that come for treatment to our spas. Taking Llandrindod Wells, I find that out of 1,000 consecutive patients 160 were cases of true articular gout, no less than 460 were cases of diseases which are usually associated with gout, such as lumbago, neuritis, some eczemas, renal calculus, or glycosuria; in addition, there were 61 cases of rheumatism and 92 of rheumatoid arthritis, so that patients suffering from gout and its allied diseases constitute 70 per cent. of the cases that come to Llandrindod Wells for treatment, and although the percentage may be a little high, as Llandrindod has rather a gout reputation among the laity, yet I think that also at Harrogate, Bath, Buxton, and Strathpeffer the gout class of disease is the one that provides the greatest number of patients. One would expect this to be so, as the waters of our British spas are of the class that improve digestion and promote elimination. I believe that the gouty and rheumatic group of diseases are so far related that they have a common source of origin, the digestive tract. If one analyses the history of a gouty family, one will find one member suffering from true gout, perhaps another from rheumatoid arthritis, another from fibrosis, another from alternating asthma and eczema, yet another from rheumatic fever. One finds families in which these diseases predominate, just as one finds families in which diseases of the respiratory tract

predominate, in which one will have nasal catarrh, one pneumonia, while another will be a bronchitic—all different bacterial diseases yet all allied. The family produces the type, individual peculiarity the variety. Patients belonging to the respiratory class benefit by a climatic or air cure ; those ranged under the other, the gouty or rheumatic class, the origin of the condition being in the digestive tract, try with great benefit a water cure. Our weather is rather against an air cure, so the members of the former class choose a more genial climate ; but in Great Britain we can offer those of the latter class every variety of water cure. Most of our spas have a greater variety of springs, and give better results in the treatment of gout than do any of the foreign spas. Harrogate and Llandrindod Wells have, for instance, a combination of aperient and diuretic springs which are not equalled in any foreign spa. In addition to the effects of spa treatment that I have mentioned, there is the chemical effect, which at present is not fully understood. We know that most of these waters are radio-active, that their chemical ions are more active than a solution of the same salts in water, so that the therapeutic effect of a bottled water is not nearly so apparent as that of the same water taken at its source ; but we do not yet know the full amount of credit to be allowed to these characteristics of our waters in the cures that take place.





## THE BALNEOLOGICAL TREATMENT OF GOUT AT THE CONTINENTAL SPAS.

By STANLEY RENDALL, M.D.

THE balneological treatment of gout and its allied complaints, rheumatism and rheumatoid arthritis, comprises both the internal and external use of the mineral waters, as administered at the various mineral water health resorts or spas.

At some of the spas the waters are used almost entirely for drinking purposes, *e.g.*, Eaux Bonnes, and La Bourboule ; at others mainly for bathing, *e.g.*, Salso Maggiore, and Nauheim ; but as a rule they are employed for both purposes, though one or the other form of use usually predominates.

The question is often asked the physician practising at these spas, "How do your waters act ?" and when it is put to those who practise at the spas the chief feature of which is the internal administration of the water an answer which satisfies both the medical and lay questioner is more easily given than when the reverse holds true, that is, where the internal administration of the mineral waters plays an entirely secondary part to its external application.

In the term "bath" all forms of external application of the water will be included, *viz.*, simple immersion baths, simple douche baths, douche baths with massage, mud baths, swimming baths, and local baths.

During a bath practically no water is absorbed through the skin, the somewhat free passing of urine after a bath being due to reflex nerve influence on the kidneys, and not to absorption of the water.

The saline constituents of the water are also not absorbed through the skin, but they do have a more or less marked stimulating effect upon the skin nerve endings, as does also carbonic acid gas. Some gases, such as sulphuretted hydrogen, may be absorbed, though only in a small quantity.

The external application of water in the form of baths and douches, especially if combined with massage, arouses and promotes peripheral circulation and removes capillary and

venous stasis ; it causes diaphoresis in proportion to the temperature of the water and so helps cutaneous elimination.

The value of cutaneous elimination in gout is far inferior to that of the kidneys : "the nitrogen excreted by the skin may amount to 4·7 per cent. of that excreted by the urine." —(E. W. Reid in Schafer's *Physiology*.) Ethereal sulphates are only present in small amounts, uric acid not at all, or in minute quantities, so that the value of elimination through the skin as the result of balneotherapy is of quite secondary importance in the treatment of gout.

It is often brought up against the various spas that they all claim to cure the same complaints, though the composition of their waters may be entirely different.

It is true that certain spas specialise in their "cure," and have a reputation for the treatment of particular manifestations of the arthritic diathesis ; for example, Bagnoles-de-l'Orne is well known for its successful treatment of gouty and rheumatic phlebitis. Plombières is specially associated with the treatment of muco-membranous enterocolitis and "enteralgia névralgique et arthritique." Nauheim for cardiac conditions, including gouty functional disturbances, such as the "irritable heart" ; Vichy for gouty catarrhal conditions of the stomach ; Carlsbad for congestive conditions of the portal system, and plethoric gouty conditions generally ; Marienbad and Brides-les-Bains for similar conditions associated with obesity ; Kreuznach and Salso-Maggiore for chronic catarrh of the respiratory organs, and gynæcological cases ; Aix-les-Bains for all the chronic articular manifestations of rheumatism and gout and arthritic complaints generally, especially rheumatoid arthritis, in which complaint Sir Alfred Garrod said, "The value of the Aix-les-Bains course far exceeds, according to my experience, that of any other known spa."

Contrexéville and Vittel have a great repute in the treatment of renal calculi and gravel ; Royat for atonic gout. La Bourboule for skin affections. But, apart from their special reputation, they would all claim, and with justice, to treat successfully, by means of their bath treatment, whether in the form of simple immersion baths, douches, sprays, or vapour baths, either alone or combined with massage, all the various

forms of the "uric acid diathesis," *i.e.*, gout and its allies. To explain this common action, some other reason than the divergent chemical composition of the various springs must be sought for, there must be some factor common to them all, moreover, one that must be of essential importance, to which all the other qualifications are secondary, though these secondary qualifications or attributes, whether due to the constituents of the waters or the technique employed, may determine the physician in advising one spa rather than the other in a given case.

This factor of supreme importance, common to all the various bath-giving spas, is the reflex influence of the skin, or peripheral stimulation, upon the central nervous system.

I think it may be truly said that it is often only very faintly realised what the amount of this stimulus may amount to, and what a very potent factor for good or ill, bath treatment may be as its result.

The stimulating effect upon the skin of any mineral water would vary with its thermality, its richness in various salts, especially chloride of sodium, in the presence and amount that it may contain of carbonic acid gas; its power of stimulation may to a certain extent depend also upon the presence of radio-activity which most spas now claim as existing in their waters. It is said to be specially active in the simple thermal and mild sulphurous waters, and it is often in these waters that the most marked effects of bath treatment upon the nervous system are observed.

Scoutetten held, so far back as in 1864, that the principal cause of the action of mineral waters upon the organism was the electrical reaction set up between the body and the mineral water.

It is less difficult to realise and understand this powerful reflex influence from skin to nerve centres, if one recalls the structural characteristics of the skin, and its marked richness in tactile and other nerve endings. "The skin is a mosaic of sensorial areas or spots, each 'spot' subserves a specific sense, touch, cold, warmth, or cutaneous pain, each, doubtless, coincides with the site of some sensorial end organ, or with a tiny cluster of such; throughout almost all regions of the skin, 'touch spots,' 'cold spots,' 'warmth spots,' and



'painful spots,' lie strewn in intercommingled fashion." — (C. S. Sherrington, Schäfer's *Physiology*.)

The combined stimulation of these sensorial areas produces a total effect upon the central nervous system that it would be difficult to exaggerate, and the degree of stimulation that is brought to bear upon the first three of them, in an ordinary douche bath with massage, is very great.

Take, for example, a douche massage bath as given at Aix-les-Bains as the type of such an operation, and I choose it simply as being the one with which I am most conversant.

The patient is massaged from head to foot by two masseurs under a constant stream of water at a temperature varying from cold to hot, say, from  $14^{\circ}$  to  $45^{\circ}$  C., though it is rarely given at a higher temperature than  $39^{\circ}$  and usually lower than that. The douche chambers are supplied with apparatus to allow of the hot and cold water being mixed as rapidly and as accurately as possible. The temperature and the pressure being under the complete control of the bath attendants, the degree of severity of the treatment can be varied as desired by the physician. The duration of a douche massage bath varies up to 15 minutes, and averages from 10 to 12 minutes, during that time from 2,000 to 3,000 litres of water are employed. In each douche chamber with two masseurs or masseuses there are three discharge pipes, one at a low pressure (6 feet) and two at a pressure varying from 6 to 14 metres. At the end of the massage the two high-pressure pipes are used to give the "Douche Ecossaise," an alternately hot and cold spray or douche.

Each chamber, in addition to the three discharge pipes, has a shower bath, which can be given alternately hot or cold, or at any intermediate temperature. In an ordinary simple or immersion bath, which is usually given at an even temperature of, say,  $35^{\circ}$  or  $36^{\circ}$  C., there is comparatively but little stimulation, if any, of the sensorial areas except the "warm spots," so that, if the patient merely lies calmly resting in the bath, the stimulus is comparatively slight. In the douche-massage bath on the other hand the stimulation of the three sensorial spots, "cold, warmth, and touch," is enormous, owing to the continuous application to these "spots" of their appropriate stimulus in a varying degree. Each change

of temperature and each change of pressure gives a fresh stimulation.

The dosage of this powerful therapeutic remedy is a very important, and also often a very difficult, question to decide, one point about it is very certain (this statement will be borne out by every practical balneologist), and that is, that it is much better to give a too mild than a too strong treatment. The happy mean is that amount of treatment that reflexly stimulates the central nervous system to the point of a tonic influence, and does not go beyond that with the risk of proving an exhausting one; it is this latter effect that so often brings the balneological treatment of gout into disrepute both with the medical profession and the public. The patient and his ordinary medical attendant will both tell you that "he did not get over his 'cure' for several months after its termination, that it left him a wreck, etc."

This exhaustion as the after-effect of a "cure" is unnecessary and harmful, and generally, though not always, preventable, not always, because there are some patients who are as idiosyncratic to the action of bath treatment as others are to any other therapeutic remedy, no matter what the dose may be; it is seen with such drugs as opium, iodide of potassium, the coal-tar products, or even quinine, etc., and probably all balneologists have seen it in the course of their practice with regard to bath treatment. I have under observation a lady who can never take a complete immersion bath without producing an uterine hæmorrhage, and after the menopause baths frequently produce a hæmorrhage from the bowels. The possessor of such an idiosyncrasy must be restricted to the internal use of the mineral water.

The varying influence of the same bath treatment on the nervous system of different individuals is well seen in the effect of the simple spray bath unaccompanied by massage, such, for example, as the needle bath or "douche en cercle"; one patient will come out from it just toned up to the right pitch, and feeling "fit for anything"; another will after it be so tired and exhausted that he is unable to do anything, save lie down and rest for some hours; whilst a third will be strung up to a pitch of nerve tension which keeps him restless and excited for a considerable time after his bath.

Often by simply modifying the pressure at which this douche is given, the two latter patients are enabled to take it as well and with as much benefit as the first, or it may be necessary to change the temperature (either the hot or the cold) and diminish the duration of the douche.

Sometimes during the douche-massage bath, the fourth kind of sensorial area or "spot" is stimulated, viz., the "pain spot," but this should be carefully avoided, and when it occurs must be considered due to an error in the technique; it can only have a harmful influence, and detract from the beneficial effect of the "cure." Too strong or painful massage produces a powerfully depressing effect upon the nervous system, and so also does too hot a bath of whatever kind. "The temperature at which the skin begins to evoke pain is that at which nerve substance begins to suffer injury." --(H. Weber.)

It is this kind of balneological treatment, where the nervous system has been too powerfully stimulated and depressed, that is generally responsible for the acute gouty crises that sometimes occur during, or immediately after, the "cure."

Most, if not all, the works published by physicians practising at the different spas draw attention to evidence of increased tissue changes and improved nutrition as the result of the "cure." Bouchard in his masterly work on *Maladies par ralentissement de la nutrition* lays great stress on the importance of differentiating the four distinct acts which together constitute the nutritive changes.

1. You may have conditions affecting the primary chemical changes or splitting up of food elements which precede their entry into the economy, and so increase or diminish their penetrative power.

2. You may have conditions augmenting, perverting, or diminishing their assimilation after their entry; these two acts constituting progressive metamorphosis.

3. You may have conditions which increase, pervert, or diminish disassimilation.

4. You may have conditions that increase, or diminish, the expulsion of the products of disassimilation from the



economy, these two final acts constituting retrograde metamorphosis.

All the diseases included in the arthritic diathesis (of which gout is the principal one) are due to influences modifying one or more of these four acts, and rational balneological treatment can only result when it is clearly perceived to which of the four the manifestation of arthritism is attributable. He who attributes every manifestation of arthritism to excess of uric acid, and so pursues an eliminative treatment, when, on the contrary, a constructive one is required, runs the risk not only of doing his patient no good, but of doing him actual injury. For example, "rheumatoid arthritis" is usually chiefly caused by conditions affecting the first two acts of nutrition, or progressive metamorphosis. There is either defective penetration of the necessary food elements required for the assimilative part of the act of nutrition, or, if there be the introduction of a sufficient amount, there is a perversion, or diminution, of the act of assimilation; so that treatment should chiefly be directed towards supplying the system with a generous supply of suitable nourishment and towards assisting the two acts of progressive metamorphosis; here the salient feature in balneological treatment is a constructive rather than an eliminative one, though both are usually combined.

Gout, on the other hand, is chiefly due to conditions affecting the last two acts of nutrition, or retrograde metamorphosis, though by no means exclusively so, for we may possibly have the existence of either or all of the first three acts, viz., excessive penetration, perverted or increased assimilation, or perverted and diminished disassimilation, and we certainly have, in addition to one or all of these three acts, the existence of diminished expulsion. This possible combination of causative factors in the production of gout make its balneological treatment somewhat complex, but as a rule the predominating feature in the treatment is an eliminative rather than a constructive one.

The nervous system is the great modifier of nutrition. The existence of trophic centres has not yet been demonstrated, but a certain trophic influence is admitted to emanate from the nerve cells, being distributed to and through the nerve

fibres in connection with the cells. The motor nerve cells are regarded as regulating the nutrition of the muscles which they supply. Muscular atrophy has for its origin a nutritional change in the motor cells, and one of the causes of this nutritional change in the motor cells is over-stimulation or functional over-strain. This effect of over-stimulation upon nerve cells has a very important bearing on balneological treatment, both as to its nature and extent. If too many baths are given, or baths of too long duration, or at too high a temperature, or accompanied by too much massage, then over-stimulation of the nervous system occurs followed by exhaustion.

The popular idea of a "cure" is 21 baths in 21 days, or more baths, if it were possible to get them in, in the traditional 3 weeks. Certainly, as a rule, 21 baths are enough, and if they are general baths more than enough. So far as a "cure" at Aix-les-Bains is concerned 14 or 15 general douche-massage baths spread over 3 or 4 weeks are sufficient; some other 5 or 6 less stimulating kind of baths are usually given with them, such as simple immersion or "douche en cercle" baths, or local vapour, or local douche-massage baths. These last are frequently given in combination with the general baths when there is any special reason for their local use, such as partially ankylosed articulations, inflammatory effusions and thickenings, where we wish to bring about absorption, or adhesions to be broken down, etc.

Even these local douche-massage baths can be given in too large a quantity or dose: in some patients with a sensitive reaction to bath treatment they are in themselves, especially when applied to the hands, sufficient to cause exhaustion, and if too vigorous local treatment be applied to such a condition, for example, as Heberden's nodes, the bad effect of over-stimulation is often made apparent shortly after the "cure," by an increase in the size and tenderness of the nodes; this is especially noticeable if the treatment has been somewhat rough and hard. Under the delusion on the part of the patient that the nodes can be rubbed down, the masseur is often encouraged by extra tips to give extra rubbing, with the result that much harm is done.

The tendency of the patient is almost invariably to urge the bath attendant to do more than is prescribed by the physician,

to give the bath at a different, usually at a higher, temperature than that ordered ; to remain in the douche, or simple bath, or "bouillon" (vapour baths), or swimming baths, longer than the prescribed time ; to get stronger or more vigorous massage ; to avoid being carried back from the douche to the hotel in a "chaise à porteur," and if they are carried back to remain in their "maillot" or pack for a prolonged period so as to, as they put it, sweat out their gout. They will also frequently curtail the one or more hours' rest ordered to be taken in or on their bed, after the bathing operation is over. In other words, the marked tendency of the patient is to make his "cure" a much more exhausting process than the spa physician has ordered, and this too in spite of the fact that he comes saying he fears the "cure" will be lowering, and that his own home doctor particularly does not wish him to be "lowered."

Owing to its *modus operandi* the effect of a "cure" is rarely apparent during its course or immediately following its cessation ; the improved nutritional processes are only set up or begun during the "cure," and are carried on after its termination for a period varying as a rule from two to four months or longer, so that it is only at the end of a variable period that the patient and his physician are able to come to a definite conclusion as to whether the spa treatment has been successful, and to what extent.

Owing to this deferred result it is a very common occurrence for the patient at the end of his course of baths to go away very discontented with the result of his visit, and then to return again next season entirely satisfied with the improvement that ultimately resulted from his first course.

The "after-cure," by which is meant a period of time between the end of the "cure" and the patient's return home, is an extremely important, almost an essential, factor towards a successful result from the spa treatment. This "after-cure" should at least be of 10 days', and, if possible, of longer, duration, preferably spent in some agreeable and somewhat bracing spot near the spa, so as to avoid a long and fatiguing journey immediately following the course of baths.

Where the "after-cure" is spent is of secondary importance, the essential point is that the bather should not return



immediately after his "cure" to his usual home occupation or pre-occupation of whatever nature it may be, social, domestic, commercial, or professional. The idea is that he should not return to his usual mental *milieu* or environment; for if he does so it often seems to arrest, or at any rate to curtail, the good effect that the "cure" has begun.

The physical character of the water employed in bath treatment is of great importance, especially where the bath or douche is combined with massage: the effect of "massage sous l'eau" with a hard, harsh water would be very different to that with a soft, demulcent water; one has only to take a bath in a hard spring water and compare the feeling with one taken in rain water to appreciate the difference. The difference between a douche-massage bath given in hard or soft water may be best described as being the difference between stroking a cat the right and the wrong way, and it has a correspondingly different effect upon the nervous system of the animal, whether human or feline so treated.

The waters that lend themselves best to the douche-massage treatment are the mild sulphur springs, such as those of Aix-les-Bains, Barège, or Luchon and Caunteret; from the fact that they contain "Barégine" or "glairine," an unctuous substance present in these waters that gives them their soft, velvety feel, almost as though liquid vaseline were being used.

#### INTERNAL USE OF MINERAL WATERS.

In the internal administration of mineral waters in gout a useful practical division is into two groups. One of feebly mineralised waters, which act not "by what they bring into the system but what they carry off," such as the Aix-les-Bains spring, "Source des Deux Reines," containing only 9 grains of solid matter to the gallon, Evian "Source Cachat," Amphion, Contrexéville, and Vittel. The two last-named waters contain a fair percentage of salts, about  $2\frac{1}{2}$  parts per 1,000, chiefly sulphate and carbonate of lime; with Wildungen they are sometimes included amongst the calcareous group of mineral waters. These waters are well borne by the stomach and can be taken in considerable quantity with impunity. They are all powerfully diuretic and some are also slightly purgative. They produce a "lavage" or wash-out of the blood, liver, and

kidneys, and so eliminate the urea, uric acid, creatin, and other extractive matters stored up in the system. The researches of Bouchard showed that urea was not only expelled, but also produced in increased quantity, by the administration of water in large quantity, apart from the effect of its mineral properties.

These feebly mineralised springs are chiefly useful in urinary and biliary lithiasis, carrying off in their passage, through the body, renal gravel by their diuretic action, and modifying the secretions of the liver.

The second group consists of more powerfully mineralised springs. They act more by their mineral constituents than by the introduction of a quantity of fluid into the system. Of such springs those most useful in gouty conditions are:—

1. Alkaline waters, represented by Vichy and Vals in France, and Neuenach and Ems in Germany. By the waters of this group the free acids in the stomach are neutralised, and the gastric mucous membrane is stimulated; they are especially useful in gastric catarrh, acid dyspepsia, gouty, bronchial, and vesical catarrh, and gouty glycosuria.

2. Saline waters, such as those of Salins, and Salies de Béarn in France, and Homburg, Wiesbaden, and Kissengen in Germany. These contain a large proportion of chloride of sodium and other chlorides, and a small proportion of other salts. Their action in gout is chiefly due to the chloride of sodium exercising an especial effect upon the mucous membrane of the gastro-intestinal tract, by stimulating the secretion of the glands, as well as the secretions of the liver and pancreas; they also exert a marked effect on the blood, and so influence tissue metabolism and augment nitrogenous metamorphosis.

3. The bitter or purgative waters, the chief constituents of which are the sulphates of magnesium and sodium with less quantities of carbonate of lime and sulphate of lime, act powerfully on the mucous membrane of the intestinal canal, giving rise to a profuse secretion, and so act as purgatives. The best known are those of Carlsbad and Marienbad in Germany, and Brides-les-Bains in France. They find their chief indications in the congestive and plethoric forms of visceral gout, portal vensosity, a sluggish condition of the liver

and intestines generally, with constipation, piles, etc.

4. The sulphuretted waters, more used externally than internally, excepting perhaps those of Eaux Bonnes, are much employed in the chronic articular and cutaneous manifestations of gout, and in arthritic conditions generally, by means of baths and douches ; also in gouty catarrh of the larynx, pharynx, and bronchi, in the form of sprays and vapour inhalations. Aix-les-Bains, Bagnères, Luchon, Barège, Cauterets, and Eaux Bonnes, in France ; Aix-la-Chapelle in Germany ; and Schinznach in Switzerland, are amongst the better known spas belonging to this division.

Referring again to Bouchard's four acts constituting nutritive changes in the body, and applying to them balneotherapy, we find that in the first act, or splitting up of the food elements with regard to the influence therein of their penetrative power, the alkaline and saline groups of waters, especially the former, are most indicated, Vichy, Vals, Ems, Salins, Homburg, Wiesbaden, and Kissengen.

In the second act where you have conditions affecting the assimilation of the food after its penetration, and in the third act, which comprises conditions affecting disassimilation, the intimate nutritional processes that are under the control or trophic influence of the nervous system would seem to be most powerfully influenced by the external use of the various mineral springs, in the form of baths, or douches, either with or without massage.

In the fourth act, which concerns conditions affecting the expulsion of the products of disassimilation from the economy, the internal administration of the less mineralised waters is indicated, such as Evian "Source Cachat," Aix-les-Bains "Source des Deux Reines," and the calcareous waters, such as Contrexéville, Vittel, and Wildungen acting as diuretics ; or the strongly sulphated waters, such as Carlsbad, Marienbad, and Brides-les-Bains, acting as purgatives, may be called for.

It is often difficult or impossible to apportion fairly the respective parts due to the internal and external use of the waters in a "cure," but it is very certain that they complement one another, and the most successful "cures" in gout are those in which they are associated.





## CHANGES IN THE JOINTS IN GOUT.

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[With Plates I.—IV.]

THE immediate cause of the clinical phenomena of gout, whether in the joints or other parts, is believed to be the deposit from the blood of biurate of soda in the form of acicular crystals.

When this deposit is rapid and in considerable amount in the cartilage and other structures of a joint, an acute arthritis results. When the deposit is more gradual and more limited, the affection, though more prolonged and more tedious, is of a milder type.

Uric acid acts as a chemical poison to the tissues, and produces inflammation and necrotic changes in the tissues involved.

Whether this tissue necrosis is a necessary prelude to the actual deposit of the urates, or, as some hold, follows from the deposit, is still an open question. When sections of cartilage are examined microscopically, the matrix is seen to be granular and eroded wherever the deposit is excessive, but where the deposit is slight little or no change is seen. It seems probable that the urates which are dissolved in the synovial fluid penetrate the cartilage and other tissues, by lymph diffusion, and then become precipitated, and that the change in the cartilage is reactionary. Precipitation probably only occurs when the synovial fluid is over-saturated, and clinical evidence suggests that re-solution does sometimes occur, presumably when the degree of saturation is greatly diminished. Sir Dyce Duckworth has shown that definite attacks of gout may occur in the big toe and no deposit be found post-mortem, which suggests, though it does not prove, re-solution. Sir A. Garrod laid it down as a rule that gouty inflammation is always attended with a deposit of biurate of soda, and it is probably equally

true that deposit will not be found in a joint which has not been the seat of an attack.

That the stress falls on the cartilage rather than on the fibrous tissues is due to the sluggishness of the lymph circulation and the feeble nutrition of the cartilage as opposed to the other connective tissues. The synovial fluid leads a sluggish existence somewhat remote from the bustling blood stream, which may perhaps explain the susceptibility of joints to invasion by chemical as well as bacterial poisons, a susceptibility which would be accentuated by a sedentary life.

In an acute attack of gout the synovial membrane presents appearances identical with those of acute inflammation, and the synovial fluid is similarly altered in character and consistency. The membrane is injected and spongy, the fluid usually thick and scanty, is turbid with polymorphonuclear leucocytes, and occasionally with crystals of biurate of soda. The articular cartilage becomes inflamed, the cells multiply, and their matrix fibrillates. In the substance of the cartilage, close to its free surface, a remarkable white deposit of acicular crystals of biurate of soda occurs. This deposit is either irregular or is uniformly distributed, and gives a "whitewashed" appearance to the cartilage (Fig. 5). The deposit rarely extends through the cartilage down to the bone, but in advanced cases the diseased cartilage is gradually eroded, and the articular ends of the bone are exposed. These in turn become the seat of inflammatory changes, attended with a similar deposit.

In these advanced cases a chronic arthritis will result, closely resembling, clinically, some forms of chronic rheumatoid arthritis, the changes which are directly due to gout having given way to changes common to many forms of chronic osteo-arthritis. In a few cases synostosis results. This, however, is rare, but may be met with in the small joints of the hand and foot. The ligaments, peri-articular connective tissues, and bursæ around the joints, may all become involved in a similar deposit. When the skin becomes stretched over these subcutaneous tophi, ulceration may result, and a discharge of the chalky material follow. In rare cases, infection by micro-organisms follows, and a suppurating joint results. Cases of acute suppuration in gouty joints have been

## PLATE I.



Fig. 1.—Hand which has been hardened in alcohol, cleared in xylol, and mounted in paraffin, illustrating extensive deposits of bismuthate of soda around the joints and in the soft parts beneath the skin.

(From a specimen in the Museum of St. Bartholomew's Hospital.)





Fig. 2.—Illustrating suppurative sinuses in and around the metatarso-phalangeal joint of great toe.  
(St. Bartholomew's Hospital Museum.)



Fig. 2a.—Surface view of Fig. 2.  
(St. Bartholomew's Hospital Museum.)

recorded by Stephen Paget,<sup>1</sup> Norman Moore, and others. That a joint disorganised by gout is liable to become a seat of an acute arthritis under the stress of a general blood infection is obvious. In Mr. Paget's case a large abscess formed in the thigh, communicating with the knee joint, and death ultimately occurred from exhaustion. The knee joint is preserved in the museum of St. Bartholomew's Hospital, and shows signs of an acute septic arthritis, while other joints in the body showed undoubted evidence of gout. Figs. 2 and 3 illustrate well suppuration following gout in the metatarso-phalangeal joint of the great toe. In and around the joint there is a deposit of urate of soda. Between the joint and the skin are several sinuses, which discharged pus during life, and the head of the metatarsal bone is considerably eroded. The specimen was removed by amputation from a man of 53, who had suffered from gout for 28 years, and who, two years before the operation during an acute attack, had pricked the swollen toe with a needle and expressed some of the chalky material.

Recently attention has been drawn by means of the X-rays to changes which occur within the bones in gout, changes which closely resemble those which occur in some forms of rheumatoid arthritis.

Localised transparent areas may be seen in the distal extremities of the phalanges, having the appearance of small punched-out holes. These are usually situated in the bones near the diseased joints, but show no communication with the joint cavities. Dr. T. S. P. Strangeways<sup>2</sup> has made dissections of bones in which these changes have been demonstrated by means of the X-rays. He has found in both cases of chronic gout and rheumatoid arthritis that the bone is definitely eroded and filled with a gelatinous-looking substance. In the advanced cases of gout a characteristic deposit of urates was also found adhering to the margin of the cavities. Berkart<sup>3</sup> examined similar changes microscopically and found deposits of urate crystals in the bone marrow, cut across in places by trabeculæ of dead bone.

In addition to these transparent areas small nodes or bony deposits are sometimes met with at the sides of the phalanges. Attention was called to these many years ago by Dr. Wynne from cases seen in Sir Dyce Duckworth's

wards at St. Bartholomew's.

More recently Dr. Ironside Bruce has by means of the X-rays focussed our attention on these gouty exostoses (Bruce's nodes), which, as Strangeways has pointed out, are true bone and not urates (which are transparent to the rays).

New bone may also be deposited in chronic gout round the margins of the articular surfaces, either irregularly or in the form of spurs, and has also been seen round sesamoid bones, such as those in the tendons of the flexor brevis pollicis.

Without clinical evidence it is frequently impossible to tell, from the skiagrams alone, whether the case is one of chronic gout or rheumatoid arthritis. All the changes seen in cases of undoubted gout may be also seen in cases in which there is no clinical evidence of gout.

Dr. J. Barnes Burt showed at the Clinical section of the Royal Society of Medicine<sup>4</sup> three cases illustrating these destructive changes in the phalanges as demonstrated by the X-rays.

No explanation is as yet forthcoming as to how these eroded areas are produced. That they are not produced by pressure seems clear from the fact that where erosion is marked, tophi are usually absent; and where large tophi are present, no atrophy occurs (*see* Fig. 4), but often on the contrary new bone is laid down.

In an acute attack of gout the bursæ in the neighbourhood of joints may become inflamed, and in chronic gout large deposits of biurates are often formed, giving rise to considerable inconvenience and frequently to inflammation of the skin over them. This enlargement, as in gummatous bursitis, is usually symmetrical. Dr. J. G. Forbes showed a case at the Clinical section of the Royal Society of Medicine<sup>5</sup> of a man only 32 years of age with a solid enlargement of the olecranon bursa, of the size of a Tangerine orange. Dr. Forbes reported at a subsequent meeting that the skin, which was red and shiny, had given way and that some of the contents of the bursa were discharged. This consisted of biurate of soda. Cultures taken from the contents of the bursa, which was subsequently removed, remained sterile. Fig. 3 is a unique specimen showing a deposit in the prepatellar bursa of remarkable size, and it will also be noted



PLATE III.



Fig. 3.—*Large deposit of biurate of soda in prepatellar bursa.*  
(a) *Deposit in bursa.* (b) *In cartilage of articular surface.*  
(St. Bartholomew's Hospital Museum.)

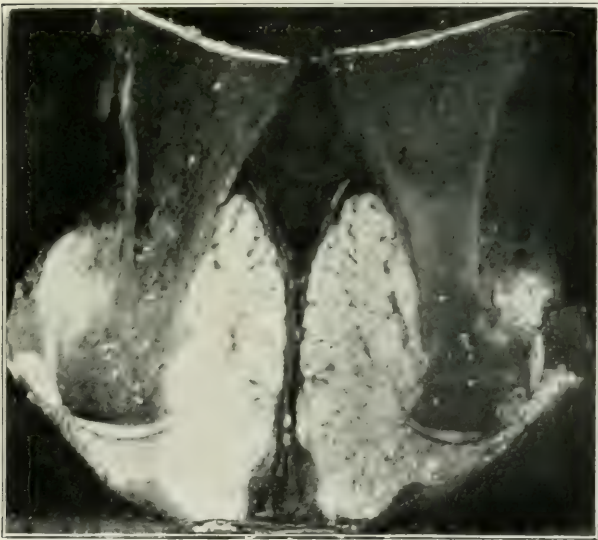


Fig. 4.—*Large deposit of biurate of soda in and around the metatarso-phalangeal joint of great toe.*  
(St. Bartholomew's Hospital Museum.)

PLATE IV.



Fig. 5.—Lower end of tibia and upper surface of astragalus illustrating uniform deposit of biurate of soda on the surface of the cartilage.

(St. Bartholomew's Hospital Museum.)

that the articular cartilage is similarly involved. The specimen was taken from a man 56 years of age, whose knees and elbows, hands and feet, showed extensive deposits. The prepatellar and olecranon bursæ of both sides were greatly enlarged and loaded with solid deposits of biurate of soda. The kidneys presented a striking appearance owing to the deposit of linear streaks of urates in the pyramids. This patient had survived an attack of tubercle, which had involved the apices of the lungs and the glands of the mesentery, as shown by old tuberculous calcareous deposits, in both these situations. A photograph taken of one of the hands of the same patient is shown (Fig. 1). As described on the plate, the hand has been prepared in such a way as to render the tissues practically transparent, so as to bring out in strong relief the uratic deposit.

<sup>1</sup> *Clinical Society's Transactions*, Vol. XX., p. 232.

<sup>2</sup> *Bulletin of the Committee for the Study of Special Diseases*, Vol. I., Cambridge.

<sup>3</sup> *British Medical Journal*, 1895, Vol. I., p. 243.

<sup>4</sup> *Trans. Royal Soc. Med.*, Clinical section, Vol. I., Part I., p. 223.

<sup>5</sup> *Trans. Royal Soc. Med.*, Clinical section, Vol. I., Part I., p. 53.





## THE METABOLISM OF NUCLEINS IN GOUT.

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DURING the past decade our views upon the metabolism of nucleins have undergone those changes inseparable from the maturing of ideas and the accumulation of scientific observations. With regard to the records of human metabolism in health and disease, the number is still, however, relatively small, for the tedious detail of this kind of work and the few workers in the field limit the extent of enquiry. Endowments and organised collective investigations are absolutely necessary if progress is to be made towards the elucidation of the causes of gout.

As a result of recent study, we have gradually arrived at the conception of an active metabolism of nuclein—a metabolism comparable with that of protein so far as chemical changes are concerned, but immeasurably superior in the extent of its “energy,” and relation to growth and production. Such a conception centres our ideas upon nuclear changes as the evidence of initiation in the processes of oxidation and the other forms of fermentative action. The presence of masked iron, phosphorus and certain forms of fat in the cell nucleus strengthens this view, and thus we are led to recognise the important part played by the nucleus in the life of the cell, and to appreciate the influence of “nuclein” heredity in cellular exchanges. The extended and valuable investigations of Leathes and his co-workers have permitted the deduction that endogenous uric acid excretion shows a definite relation to the activity of cellular processes. With regard to the inner workings of the nuclein metabolism it appears that the actual cell nucleins belong chiefly to the group of amino-purins, such as guanin and adenin, and that the oxypurins—xanthin and hypoxanthin—are intermediate products on their way to excretion, another and more advanced intermediate product being uric acid. Of these intermediate

products only a proportion reach the urine; the exact proportion was at one time stated to be approximately 50 per cent., but further work has shown that this must be regarded only as a very broad estimate, for in the same individual the output varies with a number of conditions, and these have by no means yet been fully determined. Our remarks are more applicable to the excretion of uric acid than to that of the total purins. The uric acid output varies considerably; the total purin output does not show similar variations. When the uric acid excretion falls, that of the purin bases generally rises, and the total amount of urinary purin is therefore much more unaffected by circumstances than is that of the uric acid. This point, frequently advocated, has not yet been sufficiently grasped.

The source of the nucleins present in the nuclei is a matter of much interest. It is an open question how far the food nucleins may be utilised for this purpose; in part they appear to pass through the intestinal wall unchanged; in part they are decomposed during the passage, and it may be that nuclein containing foods are a necessary corollary to the stages through which man has passed during development. A consideration of this point would lead us, however, into speculations for which the available evidence is very slight and we may deal with it more suitably at a later date.

Directing our discussion therefore to the terminal stages of nuclein metabolism, the fate of such intermediate products as uric acid and the purin bases may be touched upon. That the former as it appears in the body is of synthetic origin is very improbable, but it is possible that the latter may be traced to such a source. The uric acid present in the intestine, spleen, lung, and other organs is a result of the oxidation of purin bases. When the uric acid and purin bases pass into the blood stream they are transported to other parts of the body, but are not altered in any way during their passage. Deposited in the liver and muscles, the uric acid is decomposed into simpler bodies; if the liver or muscular tissues fail to perform this function sufficiently, the blood becomes overloaded with uric acid and the kidney has to develop a compensatory increased uric-acid-splitting function.

We are only just beginning to appreciate how complex a

process the metabolism of nuclein is, and how many little understood factors may affect the ultimate urinary output of uric acid, and we are thus gradually feeling our way to a stage when the view that estimations of urinary uric acid permit any exact measurements of the extent of endogenous nuclein metabolism may have to be abandoned. In fact, in the light of our present knowledge such determinations may be regarded only as rough guides to the results of a combination of unknown factors while we await the application of advances in knowledge to this very difficult problem of biological chemistry.

Turning to the metabolism of nuclein in diseased conditions, there seems little doubt that gouty individuals exhibit deficiencies in the fermentative part of nuclein metabolism which are manifested by an increased amount of uric acid in the blood, a lowered or subnormal output of uric acid in the urine, an increased quantity of uric acid in the venous blood, and a retardation of the output of exogenous purins.

In gout, therefore, we have to deal with some disturbance or defect in the fermentative functions of the tissues. This fact was well brought out by Gowland Hopkins, speaking upon the metabolism of purins at the 1908 meeting of the British Medical Association.

As a result of this defective fermentation an excess of uric acid appears in the arterial and venous streams. After a meal of nuclein rich food, and in leukæmia, there is also an excess of uric acid in the blood, but in the first instance the overplus is only temporary, and in the second the excretion keeps pace with the uricæmia. Another condition in which uricæmia obtains is that of the later stages of renal disease. Here the function of the kidneys gradually diminishes owing to actual loss of renal tissues, and uric acid and purins—like the other excretory products—are retained and deposited in cartilage and serous membranes. It is a common thing to find these uratic deposits *post-mortem*, although rarely do they occasion any *ante-mortem* recognition. In gout, on the other hand, the arthritic conditions are one of the chief and earlier features; the kidneys at first are generally fairly healthy, and the heart and blood pressure are not more than the patient's age would warrant. Uricæmia, however, is a



definite entity, although the output of uric acid is only slightly subnormal, and the metabolism of food nucleins is but slightly delayed.

Were it possible to maintain these clear-cut distinctions, many of the difficult problems of the pathology of gout would lend themselves to simpler experimentation. Unfortunately, the gouty condition does not admit of precise classification. For a number of years the gouty patient suffers from repeated acute attacks. Some time later—perhaps 10 to 30 years—symptoms of arterio-sclerosis appear and an associated chronic interstitial nephritis supervenes. A similar course is followed in plumbism and alcoholism. These poisons affect the general metabolism adversely and are connected with disturbances of purin assimilation and output; at a later stage they produce arterio-sclerosis, renal insufficiency, and “lead gout.”

It is therefore of importance to exactly appraise the stage of the disease when interpreting the results of experiments upon gouty individuals. When this obtains widened application many generally accepted statements will have to be re-written.

Starting therefore with the conception of a gouty arthritis which immediately precedes, or is accompanied by, certain disturbances of the general fermentative processes and a resultant uricæmia, Schittenhelm recognises three main types of disease, namely, (1) a purely metabolic form of gout, (2) a renal form of gout, and (3) a combination of the metabolic and renal forms.

The metabolic type is characterised by uricæmia, a lowered general metabolism, a subnormal output of endogenous uric acid, and a delayed or decreased metabolism of exogenous uric acid. The type in which renal lesions are prominent is associated with cardio-vascular and kidney changes, gouty manifestations the extent of which shows some relation to the progress of the cardio-renal changes, and uricæmia and defective metabolism of nuclein.

When we discuss the applications of these considerations it is difficult to put aside the many theories which have been advanced to account for the causation of gout. The views of those who favour intestinal intoxication, bacteria, excessive meaty food, and physico-chemical conditions have been stated

with admirable precision, but their authors probably await the accumulation of further evidence before pressing them unduly. Few will doubt, however, that gouty individuals possess some inborn defect or alteration of nuclein metabolism, which lowers the resistance of the tissues in certain directions, and so permits a response to irritants which are scarcely appreciated by those whose metabolism does not exhibit this peculiarity. A slight injury, or indiscretion of diet, an overloaded intestine, or an increased toxicity of the intestinal flora may be followed by a disturbance of the general nuclein metabolism and a local reaction in certain tissues. This suggests the idea that the nuclein metabolism of the gouty patient is run at high pressure or full capacity, instead of the usual normal quarter or half-pressure capacity, in order to cope with the ordinary processes of assimilation, and that there is very little reserve energy. If we admit this conclusion—and it is one which at all events is warranted by the already ascertained facts—we have the analogy of other high-pressure conditions as a guide in prognosis and treatment. In the latter instance, the regulation of the nuclein intake to the needs of the individual and the conservation of the nuclein metabolism are called for. The directions and precautions necessary to the attainment of these objects may be left to those concerned more directly with the therapy of the condition, but it may be remarked here that no medication is of much benefit unless it meets the individual peculiarities and powers, and provides for every detail and possibility of the daily life of the patients and of their offspring.



## CLINICAL NOTES ON GOUTY THROAT.

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THE condition comprised in the term "gouty throat" is, I believe, extremely common, and is merely a localised consequence of deposit in the mucosa or underlying tissues of the throat of uric acid which has either been introduced in excess, or sub-oxidised, or incompletely excreted. It is another of the protean forms of uric acid toxæmia or irregular gout. I am inclined to believe that not merely the throat conditions alluded to later, but also many attacks of naso-pharyngeal catarrh are gouty in origin, and will only yield completely to a treatment based on a recognition of this fact. In quite a considerable number of cases of naso-pharyngeal catarrh, tonsillitis, pharyngitis, laryngitis, and so forth, I have been able to detect two correlated facts:—

(1) Using the murexide test, I have in 18 cases of throat trouble in adults such as those named, taken consecutively out of a series of 26 presenting themselves to me for treatment, been able to demonstrate the presence of uric acid in the urine in most of these in marked amount.

(2) In 16 out of 18 cases disappearance of the uric acid was practically contemporaneous with cure of the throat trouble. These are facts which want considerable explanation if the conclusions I have formed are not the correct ones.

If further evidence be required on this etiological point, one has only to allude to the frequent concurrence of "rheumatism" and sore throat, the latter usually preceding the former by a day or so. To my mind they are both symptoms of the same condition—uricacidæmia.

I am convinced that heredity and high living are little more than predisposing causes of the gouty condition, and that something more is required to induce an attack. I am inclined to agree with Dr. R. Fenner that gout is of purely toxic origin, and that the cause of the toxæmia must be most carefully sought for and remedied. I am able to support from a



series of 52 cases his statement that pyorrhœa alveolaris is a very common accompaniment of gout, though in my series I find it noted in only 39 cases—a slightly lower percentage than that observed by Dr. Fenner. The cure of this condition almost always results in the disappearance of the casually related gout. And to digress for this condition—pyorrhœa alveolaris—I can recommend nothing more certain in its effects than formamint tablets. It is stated by the makers of these tablets that formaldehyde is liberated *in statu nascendi* when the tablets come in contact with the saliva, and this I believe to be a correct statement. Certainly pyorrhœa alveolaris clears up wonderfully soon under their continued use, but they must be persevered with for a few weeks. The cleansing and bracing effect exerted on the flaccid, pus-sodden gums is obvious in a few days. Moreover, it is difficult to avoid the conclusion that the saliva impregnated with formaldehyde passing on to the stomach and intestines exerts there an anti-fermentative action and prevents the formation of those toxic products which, as Dr. Fenner rightly concludes, are the immediate cause of the gouty condition.

In the *Journal of Laryngology* (August, 1889), Sir Morell Mackenzie drew attention to true gouty affections of the throat, and his article may with advantage be briefly summarised. Four typical cases were described. The first was an acute œdema of the uvula, which disappeared upon a sudden development of an ordinary attack of podagra. The second consisted in a chronic inflammation of the posterior pillars of the fauces which failed to yield to ordinary treatment, but being discovered to be connected with deficient uric acid excretion was cured fairly easily with colchicum. The third consisted in a gouty deposit around the crico-arytenoid joints on both sides, and here treatment failed. The fourth took the form of an inflammation in a gouty subject producing fungous ulcerations of the left ventricular band, and so closely resembled cancer that the physician in charge of the case diagnosed this condition. Sir Morell Mackenzie himself was so little sure of his own diagnosis that he “deemed it right to inform his patient of his suspicions and to tell him that extirpation of the larynx might be necessary.” The case, however, was cured by the waters and regimen of Wiesbaden.

The diagnosis of the condition to which I have alluded is by no means easy, and urinary test is almost always necessary to clinch it. The disappearance of the throat trouble on the onset of the definite joint affection is very common and very significant, but this light is not always thrown across our path. Gouty subjects who have had their systems depressed by over-work, anxiety, chills, etc., very frequently develop tonsillitis, which may be lacunar or parenchymatous. In the lacunar form the tonsils are dotted over with yellowish-white spots on a fairly bright-red ground, and these spots may coalesce so as to look like a membranous exudate.

In the parenchymatous form the tonsils and their surroundings are greatly swollen and œdematous, of a deep purple-red colour, and covered with a viscid mucus. The glands at the angles of the jaw are frequently enlarged and the condition is exceptionally painful, the pain being of a darting neuralgic character. The swelling, if anything, tends to become localised in the upper tonsillar region. In gouty laryngitis, the larynx is bright red and has a glazed appearance, whilst the erythema is patchy in distribution. The chief diagnostic feature of this condition is its excessive painfulness: patients complain of an extremely sharp pain which shoots up to the ear and is often excruciating when swallowing is attempted, whilst I have had one patient who suffered such pain on speaking that she resorted to pencil and paper rather than attempt it.

Gouty pharyngitis is not accompanied by anything like so much pain as the last-named condition; there is a diffuse congestion with bright patches here and there and one always finds an accumulation of rather tenacious mucus which leads to frequent "hawking." If not promptly treated this passes on to a condition of *pharyngitis sicca* with its well-known dull-red, glazed, atrophic appearance.

Occasionally one gets a case where the gouty element is so conspicuous that the merest tyro could not fail to observe it, but even in such cases I fear that one is apt not to include the throat condition amongst the gouty manifestations.

It is not, in my experience at all events, a very usual thing to have a chronic gouty condition of the throat, the acute explosive attacks being by far the most common. At

the same time chronic conditions must not be overlooked. Their recognition depends not so much on the local manifestations—for there is nothing specially distinctive about these—as upon a careful consideration of the patient's habits of life and general systemic condition, the diagnosis being clinched by urinary examination, which should never be omitted when there is any doubt in the case.

There is one point to which I think further attention should be directed, and that is the effect of the administration of formaldehyde in this dilute and innocuous form in the gouty diathesis. I am convinced that formaldehyde, and probably also other antiseptics, taken internally, will check alimentary fermentative changes and prevent the formation of injurious bye-products of digestion, thus inhibiting the onset, not merely of gouty conditions, but of many others, of the precise origin of which we are at present uncertain. Further than this, it is well known that the formates have a distinct effect on muscular tonicity. Whether this is a direct tonic effect or not I am not in a position to state. I incline to the view that the effect is indirect, and depends on the fact that the formates prevent auto-intoxication, or the development of substances which act detrimentally on muscular and tissue tonicity. The administration of formaldehyde, I am told, results in the ultimate formation of formates.

As regards treatment of these conditions in general I fear I can add but little to the already well-known practice. Constitutional treatment, and, of course, a strict dietary, play a most important part. Locally, the sucking of ice and *very gentle* swabbing of any acutely inflamed parts with Sod. Bicarb. solution, as hot as can be borne, give very considerable relief. Gargling is an absolutely useless thing to attempt—in fact patients will never, in my experience, attempt to use it after the first trial in these acute conditions, and, indeed, look askance at anyone who prescribes it.

For the subacute and chronic conditions constitutional treatment is equally necessary, coupled with fairly free purgation of Magnes. Sulph., which seems specially indicated for this purpose.

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SOME REMARKS ON THE RECENT LITERATURE  
OF GOUT.

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URIC acid as the cause of gout has been in disrepute for years, and is now regarded as a by-product resulting from as yet unknown metabolic processes. The purin bases are losing the position they held three or four years ago, and are not now looked upon as being of such importance as they were. However, it is necessary to keep up to date in the chemistry of the purin bodies, as we know that cases of gout improve if we can retard the production of, or assist the elimination of, these compounds.

Recent physiological work has, at least, made us clearer in our ideas regarding the metabolism of purins, and in the relative importance of the endogenous and exogenous varieties.

Since Burian and Schur<sup>1</sup> drew our attention to the muscles in gout these tissues have come in for investigation at the hands of several writers. Burian came to the conclusion that one of the purin bases (hypoxanthin) was normally produced in muscle, and as soon as made was oxidised to uric acid. The uric acid was then partly destroyed in the liver and partly excreted by the kidneys. He found during activity of the muscles that a certain amount of the purin base escaped oxidation, and so there was relatively a larger amount of purin base as compared with uric acid thrown into the circulation.

Kennaway,<sup>2</sup> in an article on the effect of muscular work on the excretion of endogenous purins, finds that during unaccustomed exercise the uric-acid output of the kidneys diminishes, while that of the purin bases is relatively increased, but on the whole he found that the total purin output (bases plus uric acid) was not very much increased.

It appears that after exercise the processes by which uric acid is produced are heightened. He also finds that salicylic acid caused greater excretion of uric acid in the urine without

giving rise to any increase in its formation. Salicylic acid and exercise act quite independently of one another, and when used together the amount of purin bodies excreted is extremely large. His work tends to show that during exercise the increase of the purin bases and the relative decrease of uric acid may mean that there is deficient oxidation of the former. He did not, however, find that the giving of oxygen had any notable effect.

Burgsch and Schittenhelm<sup>3</sup> have also done a great deal of work on the purin bodies in gout, and have fully investigated their metabolism by various feeding experiments; in some cases giving amino-acids and simpler compounds of this nature. They confirm the experiments which have been done to show that in gout there is an increase of the endogenous purins in the blood, and that in *every* case of gout there is uricæmia.

Bloch<sup>4</sup> finds that the output of endogenous purins is at its minimum before the acute attack of gout, and that their excretion in gouty subjects is usually below the average.

Tollens,<sup>5</sup> in investigating purin metabolism in gout with granular kidney, writes of the importance of kidney lesions on the accumulation of urates in the system.

Horbaczewski was one of the first to show that cellular organs, such as the spleen, had some action on the conversion of purin bases into uric acid. Since his original observation it has been shown by many others (Spitzer,<sup>6</sup> Ascoli,<sup>7</sup> Wiener,<sup>8</sup> etc.) that most of the cellular organs of the body have this property, and that it was specially shown in the presence of oxygen; also that some of these organs, and especially the liver, were able to destroy uric acid. The spleen and the kidney were also found to have this latter property, but to a lesser extent.

Amalgia<sup>9</sup> also finds that this action is greater in the liver than in any other part of the body.

Burian and Schur<sup>1</sup> found that when the liver was shut off from the circulation, the amount of uric acid in the urine was greatly increased.

The actual conversion of the purin bases into uric acid and the destruction of the latter appears to be brought about, at least ~~mainly~~, by the action of catalytic agents; thus the

xanthin oxydase is able to convert xanthin and hypoxanthin into uric acid, and in the liver the destruction of uric acid appears to be due to the presence of a uricolytic ferment.

Kennaway<sup>2</sup> finds that the total purins of the urine are more constant from day to day and from month to month than is uric acid, and that the amount of uric acid varies inversely, and the purin bases directly, with the volume of the urine.

Leathes<sup>10</sup> investigated the diurnal and nocturnal variations of uric acid. He found that the quantity was greatest during the early waking hours and much smaller at night. He regards his experiments as a sign that there is a variation in the actual formation of endogenous uric acid at different periods of the day.

Rockwood<sup>11</sup> also found that more uric acid formed during the daytime, and Pfeil<sup>12</sup> that there was a morning rise in the amount of uric acid passed.

Burian and Schur<sup>1</sup> suggest that the amount of endogenous purins is too great to be accounted for by the destruction of nuclear substances in the cells. It would mean more cell destruction than we are at present prepared to admit. This suggests that we may have to look round for some other method of formation, of at least part, of the endogenous purins, perhaps one in which a synthesis takes place from bodies of a much simpler chemical nature.

The above work, beyond extending our knowledge of endogenous purins, brings out the importance of muscle metabolism, and suggests that purins may not be formed, as has been supposed, from direct nuclear katabolism.

The question of diet has recently been made the subject of a paper by Bryce,<sup>13</sup> who discusses the limitations of a purin-free dietary. He treats the matter in a very rational way, and considers that in cases where there have been good results, much of it can be attributed to the diminished amount of food (especially of the protein constituent), and by general attention to the general laws of health. Although this paper has been criticised by Haig<sup>14</sup> and Bowen-Davies,<sup>15</sup> it appears to be much in accordance with general opinion.

Chalmers Watson,<sup>16</sup> in a paper discussing the value of a purin-free diet, seems also to have come to the conclusion that



it has little therapeutic value.

This is quite in keeping with the work of physiologists who do not now look upon purins as being of such importance in gout. Although there is no reason for placing the purins as the *cause* of gout, it is admitted by all that too much purin containing food will make a gouty condition worse. In each separate case we have to consider if there is a need to restrict it in the diet, and whether we can limit to any degree and for any time without the general nutrition suffering. We have also to consider if we can get the patient to persist in the change of diet for a sufficient time to be of value.

There have been some cases of inflammation in the region of the appendix reported which teach us that we must not overlook gout and rheumatism as possible causes of the trouble.

Eustace Smith<sup>17</sup> mentioned in 1908 that he had seen many cases improve rapidly under the administration of anti-rheumatic remedies, and Sikes<sup>18</sup> in the previous year recorded a typical case where there had been more than one attack simulating ordinary appendicitis in a subject of well-marked gout.

Clement Dukes,<sup>19</sup> also, in a letter on some abdominal symptoms of gout and rheumatism, mentions a case where the inflammation was undoubtedly due to gout.

Hammond<sup>20</sup> and Hernaman-Johnson<sup>21</sup> have also mentioned cases bearing on the association of joint conditions and appendicitis.

The above serves to remind us that before advising operation in appendix cases, both gout and rheumatism must be considered.

Christian,<sup>22</sup> in a valuable review of the work which has been done in the domain of experimental nephritis, discusses various points with reference to the influence of chlorides in the diet in gout and their relation to œdema. There certainly seems to be a delay in the excretion of salts in parenchymatous nephritis, and the same obtains to a lesser degree in interstitial nephritis. As to how this comes about and as to its relation to œdema there is a considerable difference of opinion. In febrile diseases and in cardiac disease with œdema there is certainly chloride retention, even when the kidneys do

not appear to be diseased; but it is quite possible that the permeability of the kidney is altered in these cases. Toxic matters in the blood may have damaged the secretory activity of the renal cells, and in connection with this we must remember that a great deal of recent work on the secretion of urine tends to show that most, if not all, of the constituents of the urine are separated by a true secretory action of the renal epithelium. Christian mentions that the above view of chloride retention is supported by the conditions in experimental nephritis caused by the administration of uranium nitrate. In the first stage there is a salt-and-water retention caused by damage to the renal cells, and, in the second stage, œdema explained by injury to, and alterations in the permeability of, the cutaneous capillaries. It is suggested that for œdema to obtain, both of these factors are necessary. Brauner<sup>23</sup> made experiments with normal persons as to their power of metabolising various substances, and the action of sodium chloride was investigated. He found, even with a constant diet, and matters arranged so as to be as uniform as possible during the experiments, that when a certain daily amount of the salt was given the quantity excreted varied considerably, the variation being as much as 31 per cent. from the average. His work shows that oscillations in the excretion of this salt are normal in the healthy individual. We want a great deal more information as to the action of sodium chloride, and, generally, of "saline waters" in gout.

Strangeways<sup>24</sup> mentions a point which may be valuable in the diagnosis of gouty joints, and may serve in distinguishing them from osteo-arthritis. He found in some of the cases he was investigating with X-rays that localised transparent areas were seen, giving the appearance of punched-out holes. He says that this appearance is often seen in chronic gout, and that it indicates a state previous to the deposit of urates.

The value of hot air for stiffened joints is treated in a paper by Sir Wm. Bennett,<sup>25</sup> who mentions its use both alone and in conjunction with other remedies.

Cataphoresis has received some attention from Somerville<sup>26</sup> and Lewis Jones,<sup>27</sup> who mention the possibility of the introduction of salicylate in this way when applied directly to the affected part. A large pad of lint soaked in salicylate

of soda is laid over the joint, and connected by means of a metal gauze electrode to the negative pole of the battery. Ionic medication has proved so useful in other diseases that we hope some more experiments as to its value in joint disease will be made.

Van Allen,<sup>28</sup> in a paper on the electrical treatment of disease, repeats what has already been known with regard to the action of the high-tension current on the arterial pressure; but his experiments have been more accurate and more carefully performed than many which have appeared in the literature on the subject. The pressure was accurately measured by the Riva Rocci instrument. He also mentions the good results obtained at the same time in the reduction of chronic congestive conditions.

Arnold<sup>29</sup> has written on the value of electrical treatment on chronic cardiac disease, and mentions cases in which the kidneys were impaired with increased pulse pressure and failing heart, where the high-tension current was of lasting benefit. The blood-pressure was markedly lowered and the metabolism increased in a way that suggested an increased oxidation of waste products. In his investigations, also, exact measurements were taken of the pulse pressure by the Riva Rocci instrument, or the aneroid sphygmomanometer. There were of course exceptions where the treatment had little or no influence on the case. The point for us is, whether this lowering of the blood pressure was of a temporary nature or did the effect last? I do not think that it has been proved that the lowering of the pressure lasts for any considerable time, although the beneficial influence on the general metabolism will continue for months after a course of this treatment.

The treatment of gout with thyminic acid has received attention in a paper by Fenner.<sup>30</sup> It has been thought by some that the endogenous urates of normal individuals are present in the circulation combined with some phosphorus-containing body, and this is said to explain the difficulty in finding urates in the blood or in health. In gout this phosphorus body may be either lessened in amount or absent. In vitro, thyminic acid certainly acts as a solvent for uric acid, and at 20° C. will take up an equal weight.




Fenner,<sup>31</sup> in some years' experience of thyminic acid, has obtained good results, and speaks highly of its remedial action in gout. It may be given in powder or tablets at the rate of 12, increased to 24, grains in the day, and in acute cases may be combined with colchicum and aspirin.

It has for some time been considered that urotropine acts by virtue of its decomposition into formic aldehyde. Professor W. E. Dixon tells me that in some recent work (as yet unpublished) he has proved this to be the case, and that it only acts when the urine is acid. So that all we can say for this drug is that it relieves symptoms by acting as a urinary antiseptic.

Dixon and Malden<sup>31</sup> throw some further light on the physiological action of colchicine. They find that it excites the nerve endings of plain muscle; and that it has little or no action on the nerves of the heart, and none on sensory nerve endings. Colchicine has no action on the metabolism, on the excretion of purins, nor on the kidney, and yet it is a valuable drug in the treatment of gout. This serves to remind us again that uric acid is not the cause of gout, but at present we have no new theory of causation to replace the old one. Dixon and Malden find that colchicine has an important action on the leucocytes, which at first are diminished in number in the circulation, and then return in increased numbers. Perhaps the leucocytes are stimulated in some way to act on the gouty poison in the system.

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## NOTES FROM FOREIGN JOURNALS.

## THE TREATMENT OF GOUT.

Lecturing on gout at the Hôpital Beaujou, Professor A. Robin said that the question of treatment comprised the treatment both of the acute stage and of the errors in diet which caused its appearance. Vigorous treatment at this time has been shown to be liable to various mishaps. Metastases are produced, the acute attacks recur more often, and the various forms of visceral gout are established more easily. The aim should be to lead from the acute to the chronic stage. The way in which the requisite remedy can be prescribed has no parallel, for the specific drug and its proper dose are at once evident. Colchicum cures the acute form and sodium salicylate the chronic. The attack in the latter case is less boisterous and more indefinite. It is, however, necessary to take some precautions before ordering the medicine. If visceral gout is present and the urine contains much albumen, no colchicum can be given. On the other hand, it is quite safe to give this drug if traces of albumen appear later. The same reservation applies to salicylate if there is albuminuria. The success of the colchicum must, moreover, be promoted by instituting strict dieting and mode of life. Complete rest in bed is necessary, and on the first day the diet must be limited to water or milk and water. If the tongue is furred, free action of the bowels must be induced by a dose of 1 oz. of sodium sulphate. This salt has the advantage of not lessening the secretion of urine. If the conjunctivæ are tinged with jaundice, a "blue pill" should be given, followed in five or six hours by 4 to 5 drachms of sodium sulphate. In place of these two drugs, 6 grains of calomel may be given in four equal doses at intervals of one hour. With regard to local treatment, cold applications may cause metastatic complications and must not be used. Chloroform liniment is also forbidden. A handkerchief should be dipped into boiling supersaturated solution of sodium borate, wrung out and applied to the affected joint with a covering of oiled silk. This should not be removed for twenty-four hours.

Colchicum is to be given on the second day, the tincture of the flowers being used, not that of the seeds:—

|                            |   |   |   |       |
|----------------------------|---|---|---|-------|
| ℞ Tincturæ Colchici Florum | - | - | - | 3x.   |
| Tincturæ Mannæ             | - | - | - | 3ss.  |
| Tincturæ Digitalis         | - | - | - | 3iij. |
| Tincturæ Quininæ           | - | - | - | 3ij.  |
| Tincturæ Belladonnæ        | - | - | - | 3iss. |
| Tincturæ Glycyrrhizæ       | - | - | - | 3ss.  |
| Misce. Fiat mistura.       |   |   |   |       |

"One dessert-spoonful (150 drops) of this mixture is to be added to four table-spoonfuls of water. One tea-spoonful of this mixture is to be taken every hour."

On the second day, all being well, the dose of the above is reduced by 20 drops. But the dose of 150 drops is to be kept up until all pains have ceased. Then a daily reduction of 20 drops to be made. Continuing this



medicine is liable to some drawbacks: such as free purging with tenesmus and profuse sweating. These do not often happen. A slight degree of sweating is no contra-indication.

With regard to chronic gout, if there is a question of an acute or a sub-acute attack, it will be necessary, after carrying out the treatment shown above, to institute a course of treatment, which, as a rule, is very long and very difficult. In chronic gout, acute outbreaks are caused by the existence of tophi, small and large, round about the joints. These, previously hard, are found, after an attack, to be, more or less, movable and sometimes even softened. The question is how to profit by these changes so as to compass the elimination of these bodies. The affection of the joint must also be treated as well as the general condition, in order first to set the patient up again and to ward off fresh attacks. Sodium salicylate is as effective in gout as in rheumatism for soothing pain and freeing the joints. It should be given at the rate of from 30 to 60 grains a day in doses of  $7\frac{1}{2}$  grains in cachets at suitable intervals. Should these prove too irritating for the patient's stomach, the following should be ordered:—

|   |                        |               |   |   |              |
|---|------------------------|---------------|---|---|--------------|
| R | Sodii Salicylatis      | -             | - | - | gr. xxx.-lx. |
|   | Syrupi Aurantii Florum | -             | - | - | ℥i.          |
|   | Aquæ destillatæ        | -             | - | - | ad ℥iv.      |
|   | Misce.                 | Fiat mistura. |   |   |              |

"To be taken in the 24 hours."

In order to make the tophi movable, it will be of advantage to order lithium carbonate, which is able to form soluble urates. The best way to give this substance is to make use of the "Sparklet." Six grains of lithium carbonate are placed in the bottle, which is then filled and charged as usual. The patient drinks this bottleful during the day. These two methods should be used alternately in succession, so as to humour the patient's stomach, which, as a rule, is very sensitive to salicylate. The latter should not be taken for longer than five days at a time. Locally, the resolution of the tophi may be hastened by the application of mineral waters containing magnesia and sodium chloride, or of a solution of sodium perborate. A little pressure may be kept up through the night, just over the hard parts. Gentle massage will also promote absorption. If fluctuation is found, the collection can be emptied by a puncture. If the tophus opens, it must be cleared out with the usual aseptic precautions. The gouty subject must not lead a sedentary life, but, on the other hand, must avoid fatigue. In regard to both physical and mental exercise he should lead a well-regulated and temperate life, never forgetting the old adage, "Bacchus and Venus are the grand-masters of gout."

On the subject of diet, Robin considers that serious mistakes about this matter are to be found in the French text-books. Patients are ordered to abstain from all red meat and only to take white meat and, especially, what is termed light food—brain, sweetbread, liver, fish-roe, eggs, and so forth. This advice is exactly the opposite to the logical indications. The object in view is the diminished output of uric acid. This output is chiefly obtained from food rich in nucleins and in collagenous matter; that is to say, young and white meats, viscera, eggs, etc. Consequently, the gouty subject ought to restrict himself to the consumption of red meat, beef and mutton, and leave out entirely from his dietary all white meat and all

internal organs. In the matter of poultry, he must select well-grown meat like turkey and guinea-fowl. Game, truffles, preserved fish—in short, any kind of food containing much extractive or gelatine—must, of course, be forbidden. He must also give up, or take very little of substances which can oxidize easily at the expense of the proteid bodies, such as sugars and hydrocarbons. He must be very moderate in the matter of fats. His ration should be made up of one-quarter meat or fish—any fish, with the exception of salmon, trout, eels, carp, and mackerel—and three-quarters green vegetables and fruit. Bread must be given up, or nearly so. It may be replaced with advantage by potatoes, which are less feculent and have an alkaline ash. The vegetarian diet, recommended by some, is a mistake; like a milk diet it tends to weaken the patient and make his gout chronic. Food which contains much oxalic, or other organic, acid, such as tomatoes, spinach, and sorrel, must be forbidden. Chocolate, being rich in oxalic acid, is proscribed, as well as tea and coffee—caffeine being one of the xanthine series. The patient may drink half a bottle of wine a day diluted plain or a neutral mineral water. Choice is limited to Chablis and Hoch, as white wines, and red Bordeaux. Beer and aerated waters are anathema.

The aim of all treatment must be to prevent the formation of excessive amounts of uric acid, to promote its elimination, and to strengthen the patient, who often has a great tendency to become anæmic and cachectic. To obtain this result the methods used are complex and varied. The best is effected by giving medicinal agents alternately with periods of repose. Much advantage is gained by taking a course of waters each year. To prevent the formation of uric acid Robin considers nothing is better than quinoformine, a combination of quinic acid with formine or urotropine. Quinic acid unites with glycocoll to form the easily soluble hippuric acid; formine and uric acid make a very soluble combination. A daily dose of from 30 to 60 grains is enough. It is easily taken in water, and does not irritate the stomach.

Sidonal (quinatate of piperazine) acts in like manner, but the urates formed are less soluble. A daily dose of from 30 to 45 grains is ample.

Piperazine is inferior to the two just mentioned, because it does not prevent the formation of uric acid. These drugs should be given regularly for periods of from 15 to 20 days, alternating with the following prescriptions. Their use should be looked upon as an established necessity, because the matter in hand is a constitutional affection, the treatment of which must be continuous. For improving the general condition and promoting nutrition Robin often gives:—

|        |                   |   |   |   |   |                      |
|--------|-------------------|---|---|---|---|----------------------|
| ℞      | Acidi Arseniosi   | - | - | - | - | gr. $\frac{1}{80}$ . |
|        | Potassii Iodidi   | - | - | - | - | gr. i.               |
|        | Pulveris Rhei,    |   |   |   |   |                      |
|        | Extracti Gentianæ | - | - | - | - | ana q.s.             |
| Misce. | Fiat pilula i.    |   |   |   |   |                      |

“Two pills to be taken daily at meal-time.”

Another method giving good results is to order 8 to 10 drops of the following to be taken daily for some days:—

|   |                           |                 |
|---|---------------------------|-----------------|
| ℞ | Tincture Ignatii,         |                 |
|   | Tincturæ Cnici Benedicti. | Partes æquales. |

The following is given alternately with the above:—

℞ Sodii Phosphatis,  
Sodii Benzoatis - - - ana gr. iv.  
Misce.

“To be given in a cachet, four times a day.”

Robin has found benefit arise from the use of the globulariaceæ, suggested by Heckel of Marseilles. He gives 10 drops a day of:—

℞ Globularini - - - - - gr. i.  
Globularetini - - - - - gr. iss.  
Spiritus Vini Rectificati - - - 3v.

Misce. Fiat mistura.

Purgatives must be used sparingly by the gouty. When necessary, care must be taken to prescribe one which does not interfere with the action of the kidneys. The best is the double tartrate of potassium and sodium (Rochelle salt) in a dose of 5 drachms. It has the advantage of making the blood alkaline.

For anæmia two of the following pills are ordered to be taken daily:—

℞ Quininæ Bi-hydrochloridi,  
Ferri Tartarati,  
Extracti Cinchonæ - - - - - ana gr. i.

Misce. Fiat pilula.

*Treatment at Spas.*—Vichy suits the florid subject, the big eater, who has uncomplicated attacks periodically. For debilitated patients, Royat is preferable, while Saint-Nectaire is more suited to those having a cachectic tendency. When the kidneys are affected, Vittel, Contrexéville, or Martigny should be chosen. In chronic gout with crippled joints the patient should be sent to Bourbonne, Bourbon-l'Archambault, and even to Aix-les-Bains.—(*Journal des Praticiens.*)

#### DRUGS IN GOUT.

Passing in review the various drugs used in the treatment of gout, Carnot deals first with the solvents of uric acid. These yield excellent results in the laboratory, but their effect is not equally marked in the organism. If, for example, the alkalies are effective, it is probably not so much on account of their solvent action, as by improving general nutrition and organic metabolism. Sodium salicylate seems to be superior to them, because, as it is not split up so quickly as the alkalies, the combination of salicylic with uric acid is only soluble in an acid or faintly alkaline medium. As heat, on the other hand, delays the action, it is necessary to keep an ice-bag constantly applied to the affected joint. Piperazine, urotropine, and citrarine do not seem to have realised expectations. Thyminic acid apparently leads in the gouty to a definite increase of the uric acid eliminated in the urine; this increase is only kept up whilst the excess of the accumulated uric acid is being excreted. As regards colchicum, nothing is known definitely as to its mode of action. If treatment by solvents suffers to some extent an actual set-back, it is much to be hoped that the study of the ferments, which have to do with the gradual disintegration of nitrogenous matter, will prove more fruitful. The liver possesses an urogenetic ferment, which is not found in the liver of



birds, who excrete uric acid instead of urea. It is, moreover, admitted nowadays that there exists a large number of ferments of this kind, the action of each of which follows each after the other—nuclease, desamidase, etc. All the ferments are present together in extracts of organs like the liver. There is, therefore, good reason for trying once more the experiments, begun ten years ago by the author, of giving liver substance. To this may be added stimulants, such as salicyluric acid. It seems to be of greater use and benefit to prevent the formation of uric acid and to promote its destruction than to try to dissolve uratic deposits once formed.—(*Le Progrès Médical*.)

#### **SOME REFLECTIONS UPON THE TREATMENT AND PROPHYLAXIS OF DIFFERENT MODIFICATIONS OF GOUT NOW PRESENTING.**

Le Gendre addressed the *Académie de Médecine* on the subject. First to be discussed were the factors, hygienic, professional, social, and domestic, which are able to modify the symptomatology of gout. From the point of view of the articular forms he distinguishes three different clinical types:—

1. The digestive type, characterised by gastro-intestinal, pancreatic, and hepatic disturbances.
2. The angio-nephritic type, in which vascular and renal affections play the chief part.
3. The neuro-trophic type.

Each of these demands its own particular treatment. Salicylates and colchicum must be used cautiously for the paroxysms of the joint-attacks. Moderate doses of colchicum must be carefully given when any of the diarthroses are affected. In attacks of the digestive type, meat must be limited, and alkalies given, taking hydrochloric acid after meals. If the action of the liver or of the pancreas is insufficient, calomel or pancreatic preparations must be ordered. For some patients treatment at Vichy or Chatel-Guyon can be prescribed. The neuro-trophic type calls for strict hygiene, intellectually, morally, and sexually. Spa treatment and living in the mountains, as at Bagnères-de-Bigorre or Luchon, are required. The patients are, as a rule, of gouty stock, and their lives must be free from fatigue and carefully ordered.—(*Revue de Thérapeutique Méd. Chir.*)

#### **DANGERS OF RADIO-THERAPY IN THE GOUTY.**

This article criticises various recent work, and leads up to the conclusion that radio-therapy is attended with danger in the gouty. The leucocytosis produced is followed very shortly afterwards by a wholesale destruction of white cells. The result is an increase of purin bodies, and fresh attacks of gout.—(*Gazetta d. Ospedale e d. Cliniche*.)

#### **CONSIDERATIONS UPON THE SPA-TREATMENT OF GOUTY PATIENTS.**

It is usual at spas to advise patients to walk pretty briskly when fasting, to drink a fairly large quantity of water, and not to take their first meal until about two hours after the last draught of water. This is done with the idea of promoting the elimination of uric acid waste-products by

the urine. Wormser points out that in many patients walking induces free sweating, so that diuresis is not increased and the curative effect is therefore lessened. Other patients under the imposed conditions suffer from dyspeptic troubles. He prefers, therefore, in the majority of cases to employ massage or a massage-douche before the water is taken, and orders the first meal to be taken one quarter of an hour at most after the last draught of water. The advantage of the preliminary massage is to be found in the increased activity imparted to the general circulation, which promotes the solvent action exerted by the water upon uric acid. It is useless, under these conditions, to take walking exercise during the treatment. Massage, moreover, brings about the absorption of the uratic deposits left by previous attacks of gout. By taking the meal a short time after the water has been drunk, the secretion of hydrochloric acid produced by the action of the water is not left too long in the stomach without food to act upon. —(*Journal des Praticiens*.)

#### SATURNINE GOUT IN A YOUNG ARTIST.

Forestier reported to the *Société de Médecine* the case of a young artist working in pastels who showed symptoms of lead-poisoning, which developed into subacute saturnine gout. He was ordered diuretic treatment and a course of douches and massage at Aix-les-Bains. The treatment removed all the symptoms in the joints.

#### TREATMENT OF GOUT.

Substances, which dissolve uric acid in a test-tube only act to a minute extent or not at all upon the uric acid contained in living tissues. Lithia salts not only do not dissolve uratic concretions, but they upset the stomach very easily. In the gouty it is indispensable to keep the digestive functions at their best. Piperazine in no way promotes the elimination of uric acid, as Fannel and Luff have proved. Salicylate of soda in large doses, recommended by Fannel, thoroughly upsets the stomach, and, according to Luff, has not the least effect in dissolving gouty deposits. Lysidine is in no better case. A possible exception, perhaps, is to be met with in thyminic acid—a product of the decomposition of the nucleins. When this is present it combines with uric acid and ensures its solution, but when absent precipitation of uric acid occurs. Schmoll estimates that thyminic acid brings about an increase in the gouty of the elimination of uric acid by the urine, which may reach to 25 or even 50 per cent. higher than the normal amount. It is given in cachets in doses of 4 grains before meals. Robin prefers quinoformine. The practitioner may try these two remedies alternately for periods of 10 days. It may be hoped that he may escape the disappointments which have so many times followed the use of similar remedies. As regards alkalies, laboratory experience does not recommend them. Sodium bicarbonate lessens the solvent power of the blood upon urates. In like case are bicarbonate of potash, citrate of potash, citrate of lithia, and phosphate of soda. As to neutralising the acidity of the humours, their acidity, according to Klemperer, is in nowise increased. The end and object of treatment must be to make the patient pass plenty of urine, and to stimulate his hepatic and gastro-intestinal functions. By so doing, the change of the soluble quadriurates into the insoluble biurates is

prevented, the liver is allowed to carry out its rôle of destructor of toxins, the presence of which in the blood vitiates the proper working of the nutritive exchanges. At the same time a check will be placed upon the over-production of uric acid, which apparently is allied to disorders of the liver. Colchicum, by increasing the secretion of the intestinal mucous membrane, prevents the formation of intestinal toxins, and, thereby, the over-taxing of the liver consequent upon the absorption of these. The most effective medicines act at once as a protection against putrefaction in the bowel and by promoting the riddance of waste already formed.

Following out these general principles, when the attack occurs, the patient should be placed at once upon water diet for 24 hours—3 to 3½ pints being given. This is the best way to deal with the intestinal fermentations. After the day's water-diet, the patient is given milk-diet, and this is kept up so long as any inflammation continues. All such things as beef-tea, meat, and other foods which tax the liver and irritate the kidneys must be forbidden. A large dose (1 ounce) of sodium sulphate should be given. It is preferable to the English method of giving calomel. With an adult it is never a matter of certainty how long a dose of calomel may remain in the stomach, which very often is not at all active. To avoid intoxication it is wiser to make use of a less dangerous purgative. The affected joint should be wrapped in wool saturated in the lotion recommended by Luff, or in a boiling solution of borax, as used by Robin. Colchicum should be given on the second day, either as colchicine—gr.  $\frac{1}{10}$ , 3 or 4 times a day; as vinum colchici—m. xxx.—xl. at first for one day, then m. xv.—xx. 3 times in the 24 hours, adding gr. xl. of potassium citrate to each dose; or, as preferred by Robin, the tincture of colchicum-flowers. Sodium salicylate must be used cautiously. It lessens pain and relieves the joints, but may prove harmful to the kidneys.

When the joints remain enlarged and puffy, massage will be of great benefit, provided all pain has gone. The Scotch douche succeeds in chronic cases. Baths of super-heated air are equally useful. When a joint is disabled by large gouty deposits, cataphoresis has brought about good results. The joint is placed in a bath of iodide of lithia (2 per cent.), or of 5 per cent. bicarbonate of potash. The positive electrode is placed in the bath; the negative pole, moistened with hot water, is applied to the lumbar region. A current of from 150 to 200 milliampères is passed for from 20 to 30 minutes. The lithia is said to penetrate the tissues, and being brought directly into contact with the gouty deposit tends partly to dissolve it.—(*Journal des Praticiens*.)

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## Notes by the Way.

July, 1909. AS the special Gout number of THE PRACTITIONER of July, 1903, has been reprinted twice without enabling us to meet the continued demand for the issue, it has been found necessary to bring out another number setting forth the present-day views on this malady and its treatment, so that our readers may have at hand the most recent and reliable information on the subject. Some of the articles in the present issue appeared in July, 1903, but have been revised, amplified, and brought up to date by the respective authors. Dr. Goodhart's article is reprinted by special request, in consequence of the number in which it appeared being out of print. The fact that the majority of the communications published in this issue are original, fully justifies the view that, taken as a whole, this special number represents the most successful teaching of the day in regard to gout and its protean manifestations.

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ONE of the most important articles is that by Dr. Percy Kidd on the cardio-vascular manifestations of gout, in which he discusses the "gouty heart," and points out how Mitchell Bruce considers the condition to be functional at first, whilst Milner Fothergill holds that it is a late phase in the course of chronic interstitial nephritis. Another valuable addition to our knowledge of the subject is furnished by the lucid article of Dr. James Taylor, dealing with the relations of gout to diseases of the nervous system, in which he shows how in gout, glycosuria, though often transient, may sometimes eventuate in true diabetes. Dr. Taylor further declares that we must recognise the existence in the gouty of a true glycosuric peripheral neuritis. Another article is a remarkable

and practical contribution on the cutaneous manifestations of gout and their treatment by Dr. J. Galloway. Our readers will find the thorny subject of the treatment of gouty eczema fully dealt with in this paper and much information on the use and abuse of anti-pruritics. Recently a vast amount of work has been done in the investigation and study of X-rays, and the results of the observations are summarised in Mr. C. Gordon Watson's views; he states that without clinical evidence it is frequently impossible to tell from skiagrams alone whether a case is one of chronic gout or rheumatoid arthritis; all the changes seen in cases of undoubted gout may be also seen in cases in which there is no clinical evidence of gout. The balneological treatment of gout is also thoroughly brought up to date, and full details are supplied of the most modern methods of spa treatment. This has been effected by the two original articles supplied by Dr. Rendall and Dr. Ringrose Gore respectively, the first dealing in a comprehensive manner with the Continental spas and the latter more particularly with the treatment of gout at Llandrindod Wells. The claims put forward in regard to the purin bodies as causing gout are now losing their position, still the scientific investigation of these substances continues and the whole question is well put by Dr. A. W. Sikes in his contribution. The position at present appears to be that although there is no reason for placing the purins as the cause of gout, yet it is admitted by all that too much purin-containing food will make a gouty condition worse.

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#### Colchicum in Gout.

THE use of colchicum in the treatment of gout still continues to be a subject concerning which diverse opinions are held. In the judgment of some physicians, the deleterious effects sometimes produced by colchicum render its administration a risky proceeding, whilst other leading teachers of medicine believe in its exhibition in suitable cases. Some prescribe the drug in large doses; others again declare that it should be given only in small amounts; some aver that colchicum, if it is to

be of service, must purge the patient ; whilst there are a large section of medical men, gradually increasing in number, who do not regard purgation as necessary. The fact is undoubted that colchicum can alleviate pain in the gouty and produce a speedy amelioration of the distressing symptoms, but the objection is still sometimes urged, that though it relieves the pain, it may produce a return of the affection. On this point competent observers have failed to note any tendency to relapse after efficient treatment with colchicum, and modern investigations show that colchicine has an important action on the leucocytes, which at first are diminished in number in the circulation, and then return in increased numbers. As pointed out in Dr. Sikes' communication in this issue, perhaps the leucocytes are stimulated in some way to act on the gouty poison in the system.

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#### Microbic Origin of Gout.

A MICROBIC hypothesis of the origin of gout has been advanced by Dr. C. Wynn Wirgman ; he wants to know why an inflammation that has all the characters of a microbic invasion should be attributed to a chemical cause. Certainly it is in his favour that the forms of "irregular gout" (so called) are such that, in the absence of this fetish description, they could be classed either as toxæmias or as local infections. Dr. Wirgman ascribes the cause to pyorrhœa alveolaris, and declares that he has never failed to find pyorrhœa in an adult who has had rheumatism or gout. Dr. Ringrose Gore is a strong believer in the theory that gout is due to a bacterial toxin formed in the intestine.

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THE advisability of using alcohol in gout is a matter requiring judicious consideration, and on this point our readers will find full directions in the papers in this issue by Sir Dyce Duckworth, Dr. Goodhart, and Dr. Luff. It is interesting to compare their views with the opinion expressed by Dr. Burney Yeo in his *Manual of Medical Treatment*, who points out that with most



persons, and especially in women, it is best to avoid alcoholic drinks altogether ; in others their moderate and discriminating use is not injurious. Of all alcoholic beverages, malt liquors are most prejudicial in this diathesis, and heavy, bad quality wines. With regard to wines, it is not the name, but the quality of the wine which is important ; and a matured wine of fine quality will often be found to agree with a patient who would be made ill by the same wine when of inferior quality. The wines which act freely as diuretics are the wines which agree best with all persons. In some this will be champagne, in others claret, in others hock, and so on. An eminent physician of New York has said that he found champagne and port—carefully selected—the best remedies for *his* gout. Certainly many gouty persons find champagne the wine that suits them best. But it will also happen that gouty persons who have drunk champagne with impunity for many years will suddenly find that it provokes some form of goutiness which disappears on relinquishing the use of this wine. For those who find a certain amount of wine a necessity, it is advisable that they should add to the wine they drink a small quantity of an alkaline water. In the case of some feeble gouty patients a glass of sound port, matured in wood and diluted with twice as much hot water, is a harmless and comforting drink, especially in winter. For others 2 or 3 tablespoonfuls of old whisky or good cognac daily, freely diluted with water, may be permitted. But it is undoubtedly better for the gouty person to abstain entirely from alcohol if he can do so with comfort. Dr. Arthur Latham, in his *Dictionary of Medical Treatment*, advises in acute gout that alcohol should be forbidden unless the condition of the heart calls for its administration. In the latter case, old brandy, well diluted, should be given. In chronic or subacute gout he says that in the great majority of instances alcohol should be avoided. In those with enfeebled digestion a little whisky or brandy or light Moselle with meals may be permitted. According to Dr. William Murrell it is useless urging total abstinence in the case of a patient who has been perhaps a somewhat immoderate moderate drinker all his life. He will acquiesce in moderation but will kick at deprivation. The best drink for a person of this description is whisky well diluted, always supposing that he knows the difference

between whisky and silent spirit. The whisky should be taken at meals only, and at night. He should be an abstainer between meals, not merely between drinks. The only wine admissible is one glass of port after dinner, and that rarely does any harm.

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The Causation of  
Gout.

IN our last special number on gout we concluded with the words "gout is a disease which we do not understand," and even now it is impossible to avoid admitting that concerning the real nature of gout our information lacks completeness and is still wanting in regard to full scientific accuracy.



# THE PRACTITIONER.

AUGUST, 1909.

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## SOME CASES OF CHRONIC ULCERATION OF THE RECTUM.<sup>1</sup>

By D'ARCY POWER, F.R.C.S.,

*Surgeon to, and Lecturer on Surgery at, St. Bartholomew's Hospital.*

I HAVE recently had under my care at St. Bartholomew's Hospital, several patients who have suffered from chronic ulceration of the rectum, and I found myself so ignorant of the causes and classification of this condition as to make it worth while to devote more attention to it than I had hitherto done.

### A.—ULCERATIVE COLITIS.

The first two cases presented many features in common, and as both patients died the post-mortem examination afforded an opportunity of verifying the diagnosis and observing the actual state of the bowel.

*Case I.*—The first patient was a married woman, aged 24, living at Hampton Court, who was admitted into St. Bartholomew's Hospital under my care on April 26, 1908, for the treatment of a constant diarrhœa, with passage of blood and mucus from the bowel.

She said that she had been confined of her first child, on January 28, 1908. The labour was easy, and she went about her household duties on the tenth day. Early in March she began to suffer from diarrhœa, with the passage of blood and mucus. The symptoms were so severe that she was obliged to take to her bed after a few days, and she had not again done any work. She had lost all control over her bowels a month before her admission to the hospital.

When she first came under observation, she was a pale and flabby woman, not wasted, with a temperature of 101° F., a pulse of 120, and a respiratory rhythm of 26. She lay in bed absolutely listless, with a furred tongue, and she passed her motions under her many times a day. The abdomen was rather distended, and was everywhere tender.

I examined the patient under an anæsthetic on April 30. The anus was patulous, and was marked by numerous scars radiating from the margin. There was the scar of a small ulcer in the centre of the perinæum, and the skin was ulcerated from the anus to the tip of the coccyx. Several drachms of clear mucus escaped as soon as the forefinger was passed through the anus, and the whole circumference of the rectum was found to be ulcerated as far as

<sup>1</sup> Read at a meeting of the Ealing Division of the British Medical Association.



the finger could reach. The bowel was narrowed about three inches from the anus, and there was a stricture which proved to be apparent rather than real, because the constricted portion of bowel was easily dilated until two fingers could be passed through it. Some pedunculated masses of mucous membrane could be felt in the rectum and were afterwards seen by the aid of the speculum. The whole ulcerated surface bled easily. The sacral glands were enlarged. The vagina showed two small ulcers at the introitus, but there was no fistula, either vaginal or anal. Local remedies failed to cause the slightest improvement, and, as I thought the inflammation was localised to the rectum, I performed a left inguinal colotomy on May 7. The descending colon was found to be as seriously ulcerated as the rectum, and the walls were so softened by the inflammation that the sutures would not hold and I was obliged to leave the intestine unopened, shutting off the peritoneal cavity with strips of gauze. The patient died on the following day.

The post-mortem examination showed that the pelvis contained faecal-smelling pus, and that the coils of intestine lying in the pelvis were congested, though there was no general peritonitis. The large intestine was uniformly ulcerated throughout its whole extent, whilst there were numerous polypoid tags between the ulcerated patches of mucous membrane. Some of these tags had coalesced to form tunnels or arches, which were sufficiently strong to support the weight of glass rods passed beneath them. There was no stricture of the rectum, and there were no abscesses in the liver. The other organs were healthy.

*Case II.*—A few weeks later a married woman, aged 46, came under my care on account of a fistula and inflammation of the large intestine. She was admitted into St. Bartholomew's Hospital, on May 30, 1908, saying that she had been operated upon at St. Mark's Hospital five years previously for a fistula, and had been discharged cured. She had progressed satisfactorily for two years, and had then noticed blood in her motions at intervals of three or four months. Each attack lasted a few weeks, but the present attack, which began six or seven weeks before her admission to the hospital, had confined her to bed for the last three weeks. She was passing about seventeen motions a day. The patient had lived at Walthamstow, and had drunk the water supplied by the town. She had never been out of England. She had been twice married, the first time for fifteen years, without children; there had been one child, a boy aged four years, by the second marriage. She had never had a miscarriage.

The patient looked ill, but she had not wasted. Her temperature was  $100.2^{\circ}$  F.; pulse 120, and respirations 28. Appetite poor. Examination showed that the abdomen was natural, without any abnormal dulness or tenderness on palpation. There were two small fistulæ on the left side of the anus and close to it; there was also the scar of a healed fistula. The urine had a specific gravity of 1.020; it contained a slight trace of albumin.

The fistulæ were laid open on June 3, 1908, and the rectum was then found to be ulcerated, and to contain several polypoid masses about two inches above the anus.

I asked my colleague, Dr. Howard Tooth, C.M.G., who has had a very large experience of dysenteric inflammation, whether he would kindly treat the patient for the inflammation of her large intestine. He did so from June 12 to July 2, but in spite of every care she steadily got worse. I then examined the patient under a general anæsthetic by means of the sigmoidoscope, and found that the rectum was extensively ulcerated and contained

numerous polypoid growths. There was an abundant discharge of sanious pus, and the fistulæ had become large unhealed tracts with callous edges. The general condition of the patient rapidly became worse, and she died from exhaustion on July 9.

The post-mortem examination showed extensive sloughing fistulous tracts extending from the anus alongside the rectum. The small intestines were healthy, but the large intestine was extensively ulcerated, the mucous membrane being in a polypoid condition. The appendix was ulcerated and distended with pus; the cæcum was comparatively healthy, but the ulceration was most marked in the rectum. There were pockets of pus in the pelvic tissues round the lower part of the rectum. The liver was enlarged and fatty; the kidneys showed interstitial change.

*Case III.*—A housemaid, aged 20, was recently admitted into St. Bartholomew's Hospital under my care, complaining of considerable bleeding from the bowel when she went to stool. She said that she had suffered from constipation for the last three or four years, and had passed a yellowish offensive slime for more than a year. This discharge was generally noticed when the bowels acted, but it sometimes came away independently and stained her linen. At first there had been loss of blood from the bowels at intervals and during defæcation, but of late the bleeding had occurred daily, to the amount of two or three ounces.

The patient was extremely reticent about her past history, and said that she had ailed nothing. She was the youngest of five children, of whom one brother and a sister were living. The other children died in their infancy, the one from "fits," the other from "bleeding of the navel." The mother is alive and well; the father, who had served in the army, died young.

The patient was in a very miserable condition when she was first seen. She was thin, anæmic, and worried by a stinking discharge from the bowel. Nothing abnormal was discovered by an examination of the abdomen, nor was there any unusual tenderness. Examination under an anæsthetic showed a ruptured perinæum, which had been sutured at some time not very long before. The mucous membrane inside the rectum was healthy for about an inch, though the surface was covered with an offensive and blood-stained discharge, which was slimy. The bowel was narrowed by a thickening of the walls of the rectum about two inches above the anus, the thickening being more marked posteriorly than in front. The narrowed portion only just admitted the tip of the forefinger, but there was an ulceration of the whole circumference of the bowel immediately below the stricture, though it did not extend to the anus.

The patient began to improve as soon as she was given three-grain doses of grey powder three times a day. She regained her colour and rapidly increased in weight. The improvement, however, was only maintained to a certain point, and the ulceration then remained stationary. I ordered her, therefore, suppositories of mercury, each suppository containing one grain of mercury, one being given every other day. I examined her on October 29, 18 weeks after I had first seen her. The rectum was dry, and was covered in its lower part with healthy mucous membrane, but there was a stricture of the mucous and submucous coats two inches above the anus. This stricture was soft and ring-like. It could be easily dilated until two fingers could be passed through it. The mucous membrane immediately above the stricture felt rough, but it was not ulcerated, and there was no undue amount of mucus covering it. The patient was discharged, with

instructions to pass a rectal bougie through the stricture, and to return for advice if she had any further trouble.

These three cases are clearly examples of the condition known as sporadic ulcerative colitis, which is an infective inflammation attacking all parts of the large intestine. It is not identical with dysentery either of the bacillary or amœbic type, nor is it quite the same disease as asylum dysentery. There was no cause localising the inflammation to the rectum in the first and third of the cases, except perhaps the changes occurring in connection with recent parturition. In the second case, the rectum had already been the seat of chronic inflammation, as was shown by the fistulæ, and the patient was also suffering from Bright's disease.

#### B.—"SYPHILITIC" ULCERATION OF THE RECTUM.

The next group of cases is often classed as syphilitic inflammation of the rectum. It would be better to call it ulcerative colitis occurring in patients who have acquired syphilis. Every large pathological museum contains one or more specimens of the disease. The museum at St. Bartholomew's Hospital is the one I know best, and it contains the following examples, which happen to have unusually full clinical histories attached to them:—

*Case IV.*—The rectum and adjacent portions of the colon show "syphilitic" ulceration of the mucous membrane. The whole mucous membrane of the rectum is destroyed, except one small patch, which is thickened and opaque. The exposed submucous surface is uneven, nodular, and thickened by infiltration. On the mucous surface of the colon, there are large ulcers, round or oval in shape, regular in outline, and measuring from one-sixth to two-thirds of an inch in diameter. The edges are clean, sharply cut and scarcely thickened. They are surrounded by mucous membrane, which is either healthy or slightly congested. Their bases are for the most part level, flat, or covered with low granulations which rest upon the submucous tissue. The muscular wall of the bowel is not affected, and there is no marked thickening or hardening below or around. Branching blood-vessels are seen on some of the ulcers, whilst in others a small island of mucous membrane still remains at the centre of the base. At some places two or more of the ulcers have extended, and united to form a large ulcer of irregular shape, and by such coalescence some of the ulcers in the lower part of the colon are continuous with the ulcerated surface of the rectum. No ulcers were found in the cæcum, nor in the small intestine, except a very small one of doubtful character in the ileum.

The specimen was obtained from the body of a woman, aged 28, with the following history:—She had suffered from syphilitic sores at the age of 21, the sores being shortly followed by a scaly cutaneous eruption. About a year later, she became subject to an itching at the anus, and a growth of skin appeared reaching a short distance into the rectum. Two years after



this, a large ulcer formed in the neighbourhood of the anus, and she was admitted into University College Hospital. The ulcer was destroyed by the application of some corrosive fluid. The growth at the anus was removed, and rectal bougies were passed in order to dilate a stricture which was already in process of formation. Being much relieved at the end of a fortnight, and her general health having improved, she was made an out-patient; but, soon becoming pregnant, she ceased to attend, and it was afterwards ascertained that her child was born dead.

She was admitted into St. George's Hospital, at the age of 25, on account of a recto-vaginal fistula. The sphincter was divided; bougies smeared with blue ointment were passed frequently; and the patient was placed under the influence of mercury by means of a calomel vapour bath. She again improved rapidly, and was soon discharged.

At the age of 26, having in the interval borne another child, she applied at King's College Hospital on account of a relapse into her previous condition. She received relief from the same kind of treatment as before, and she soon left the hospital.

She became an in-patient at St. George's Hospital a second time, at the age of 27. The rectum was then found to be greatly narrowed, so that only a catheter could be passed through the stricture. The patient's general health, which had been tolerably good, now began to fail, and she lost flesh rapidly, after suffering from sickness and diarrhœa for some days. She remained at home with her friends for a few weeks after leaving St. George's Hospital, and she was then brought to St. Bartholomew's Hospital. At this time, she was in a state of extreme emaciation and misery, evidently suffering from pulmonary phthisis, so that any expectation of affording her permanent relief seemed hopeless. She continued to decline, and died on March 1.

At the post-mortem examination, the lungs presented the ordinary appearances of extensive ulceration around tuberculous deposits; numerous cavities existed in the upper lobes, but no syphilitic affection could be discovered; the heart was normal; the liver was rather large, pale, and tough, but it gave no reaction with solution of iodine, and exhibited no specific syphilitic alteration; the spleen and kidneys were normal.

The patient was under the care of Sir James Paget, who said, in commenting upon her case:—"The chief points of interest are in the characters of the disease found in the rectum and colon, which may be studied as an example of syphilitic disease of those parts. The character of the ulcers is worthy of careful study, for they must be distinguished from the allied condition due to tubercle, since they are very different from any form of catarrhal, follicular, typhoid, dysenteric, or cancerous ulceration of the bowel.

"The ulcers are limited to the large intestine, and decrease in size and number from the rectum upwards, conditions which are rarely observed in tuberculous conditions of the intestine. There is no trace of tubercle in the submucous or other tissues of the intestine, none in a Peyer's patch, or at the base or edge of any ulcer, or in the subperitoneal tissue below an ulcer.

"The shape and other characters of the ulcer are quite unlike those of intestinal tuberculosis; they are regular, with sharp, even, and well-defined edges with level bases; they are not excavated; they do not extend through the submucous tissues, their edges are nowhere eroded or undermined, sinuous, thickened, brawny, or infiltrated; the subjacent and intervening

structures appear healthy, except at the rectum."

"The ulcers are not grouped, and where, by extension or coalescence, they have lost their original contour, they have acquired one altogether irregular, and have in no instance even tended towards that girdle-like shape, encircling the canal of the intestine, which is so characteristic in the large coalesced tuberculous ulcers." Tuberculous ulcers, too, are usually separated by large tracts of pale mucous membrane, which does not materially differ from the healthy tissue, although enlarged solitary follicles may often be seen when it is held up to the light. But in the form of ulceration which has occurred in this specimen the large irregular sloughs are separated from each other by very narrow strips of eroded and inflamed mucous membrane. No perforation of the inflamed bowel has occurred, but, neither in ulcerative colitis, nor in tuberculous ulceration of the large intestine, is perforation of frequent occurrence.

"Thus," Sir James Paget continued, "by negative as well as by positive characters, these ulcers are clearly distinct from the tuberculous, and, as they have not even a remote resemblance to any other form of intestinal ulceration, and occurred in a patient who showed abundant evidence of syphilitic inflammation, they may fairly be looked upon as being themselves caused by syphilis."

It thus came about that, in England, at any rate, there was established a form of syphilitic ulceration of the rectum which had the weighty support of the authority of Sir James Paget, and before long other cases were recorded. Dr. Dowse gave the following account of a case (*Trans. Path. Soc.*, Vol. 26, p. 111):—

*Case V.*—F. W., aged 37, admitted into the Central London Sick Asylum, Highgate, on July 23rd, 1874, died December 4th, 1874. She is of dark complexion, was married at the age of 19, and previously enjoyed excellent health. She has been leading an irregular life for some years past, and about five years ago she contracted syphilis, which went through its various stages. She suffered from ulceration of the vagina and purulent discharge. It must be noted that the tertiary stage of syphilitic infection had passed away before the ulceration of the bowel commenced. The first indication which she had of disease of the rectum, was the pain experienced upon passing a motion, and this was usually attended with hæmorrhage and great irritability of the sphincters. The spasmodic stricture was so severe at times that no faecal matter could be voided; at others, the contents of the bowel were violently ejected. This condition of the sphincters corresponded with the irregular action of the bowels, which were at times much relaxed, at others constipated. The hæmorrhage ceased in a few months, but was followed by a dark-coloured purulent discharge. There was no vomiting, but considerable abdominal distension, with tormina and colic-like pains of a severe character. The sphincters were competent, but, at times, became almost involuntarily relaxed. At this time the diarrhœa was almost constant, and there were sometimes 10 or 12 actions of the bowels during the day. This was greatly influenced by diet, and the use of hot drinks or fluid in quantity of any kind. The pain was usually much worse at night, of an aching, bearing-down character, not confined to the rectum alone, but seeming to drag upon all the contents of the pelvis. There was no irritability of the bladder, which is usually a common con-

dition. There were marked signs of the tertiary syphilitic state, such as of chronic periostitis of the cranial and long bones, and the scars of past ulceration.

Examination of the anus showed the scars of old fistulæ, but there was no apparent burrowing of matter in the ischio-rectal fossæ. There was a stricture of the rectum beyond the internal sphincter which would just admit the passage of the forefinger, and yielded somewhat to pressure. The ulceration commenced at the verge of the anus, and extended for some distance up the gut, the wall of which felt rough to the finger and uneven, like a worn-out nutmeg grater. Grey ulcerations were seen by the aid of the speculum between the elevations, which were pendulous and of a bright vermilion colour. The bowel was evidently fixed in the surrounding connective tissue by a hyperplastic deposit. There were no fistulæ communicating with the vagina, as is often the case in this form of ulceration. The patient died from pain, exhaustive diarrhœa and possibly, pus-poisoning.

A post-mortem examination made twenty-four hours after death showed that the cranial and thoracic viscera were healthy. To the naked eye the lungs were quite free from tubercular change. Upon opening the abdomen the liver was found to be adherent to the diaphragm and posterior abdominal wall, and its anterior surface was covered by a layer of thick cheesy pus. The contents of the pelvis were matted together by a hyperplastic indurated inflammation.

This case appears to me to be one of ulcerative colitis, of the type which is often known as "asylum dysentery," occurring in a syphilitic patient, and it should not, I think, be classified as syphilitic inflammation of the rectum.

The next case is interesting, because it appears to belong partly to the cases of ulcerative colitis in syphilitic patients, and partly to another group which must be considered immediately:—

Case VI.—The specimen is in the museum of St. Bartholomew's Hospital (No. 2059), where it is described in the catalogue as "A rectum affected with syphilis." Towards the upper portion of the bowel the mucous membrane is thrown into large rounded nodules and folds, whilst the submucous tissue is greatly thickened. From this point to the anus the inner surface is covered with cicatricial tissue, perforated by very numerous apertures, and the bowel is here contracted. A glass rod is placed in a recto-vaginal fistula, immediately above the external sphincter; other fistulæ are marked by portions of glass which are inserted into them.

The patient was a woman, aged 27, who suffered from syphilis. She had borne a dead child after hard labour, during which instruments were used, a year before her admission to the hospital. She suffered from a chronic ulceration of the tibia which appeared to be gummatous. I acted as her dresser for some months, and, during this time, she had lost all control over her bowels, which constantly discharged a foul-smelling mucus. She died a few days after a colotomy had been performed by Sir William Savory. The post-mortem examination showed the sloughs and polypoid masses in the rectum with which we are now familiar in cases of ulcerative colitis.

The patient was a respectable young woman, who had been seduced



under a promise of marriage. She felt her position acutely, and I have little doubt that she died from ulcerative colitis, to the ravages of which she was predisposed by her mental condition, by the syphilis, and by the inflammation started during her labour.

#### C.—CHRONIC ULCERATION AFTER LABOUR.

The next group of cases, in which there has been chronic ulceration of the rectum, includes those in which the ulceration is directly traceable to infective processes starting after labour. I believe that Case III. should, in all probability, have been included in this group, but specimen No. 2048A, in the museum of St. Bartholomew's Hospital, is a good example.

*Case VII.*—The patient was thirty-two years of age, and was said to have been quite well until six years before she was admitted to the hospital, when she gave birth to a stillborn child at the eighth month. This was followed by intense pain in the lower part of the abdomen, and other symptoms of pelvic cellulitis. A month later she had a discharge of blood and pus from the rectum, and this continued rather profusely for some weeks. Soon afterwards she noticed a slight difficulty in passing her motions, and she also had some discharge from her bowel. This trouble gradually increased for five years, and during the twelve months preceding her admission to the hospital she had become rapidly worse.

She was found on admission to be anæmic and weak, with considerable œdema of the lower extremities. There was a large amount of albumin in her urine. She was greatly distressed owing to the state of her bowels, and there was a profuse purulent discharge, whilst obstinate constipation alternated with attacks of diarrhœa. A tight stricture could be felt in the rectum; it commenced three inches above the anus, but the upper limit could not be determined. She died a month after admission.

The rectum with the uterus and a portion of the vagina were preserved after the post-mortem examination. The stricture proved to be tubular. It began three inches above the anus, and extended upwards for a distance of six or seven inches. It was so tight that a glass rod, which was passed through the upper portion, almost filled the lumen of the gut. The stricture seemed to be produced by a thickening and contraction of the muscular coat. The muscular element had disappeared, leaving only a greatly hypertrophied fibrous network. The upper part of the stricture ends abruptly, but the mucous membrane is ulcerated superficially for a distance of from one to two inches higher, the muscular coat, corresponding with this portion, being somewhat hypertrophied but not contracted. There is a well-marked cicatrix at the bottom of Douglas's pouch; it appears to indicate the site of an old abscess cavity in the fascia between the peritoneum and the rectum. The rectum opposite to this point has been dragged upon, and drawn towards the cicatrix.

#### D.—SYPHILITIC ULCERATION OF THE RECTUM.

Chronic syphilitic ulceration of the rectum is by no means so common as is generally supposed. Ulceration occurs in

connection with primary sores, but it is too rare in this country to be of any practical importance. Prof. E. Lang, of Innsbruck, has shown that a superficial erosion of the rectum takes place in a certain proportion of syphilitic patients during the secondary stage. Gummatous inflammation of the rectum is more frequent. It occurs during the tertiary stage, and is either sclerosing—"the ano-rectal syphiloma" of Prof. Fournier—or it is of the usual gummatous type.

(i) *Ano-rectal Syphiloma*.—In these cases there is an infiltration of fibro-plastic tissue into the submucous tissue which gradually invades all the coats of the bowel. The process is limited to the lowest part of the rectum, immediately above the sphincter, and produces a stricture by the gradual shrinking of the inflammatory products. This induration may be formed without ulceration of the mucous membrane, and may give rise to so little inconvenience in its earlier stages as to pass unnoticed. It is associated in the later stages with the formation of abscesses, fistulæ, and ulcers.

The museum of St. Bartholomew's Hospital contains a good example of the condition.

Case VIII.—The patient, aged 35, acquired syphilis about twelve years before her admission into St. Bartholomew's Hospital. She was a pale, weak, and cachectic woman, and it was found, on examination, that the margin of the anus, the rectum, and the vagina were infiltrated with a mass of cicatricial tissue. The liver dulness extended as low as the umbilicus. The urine was acid, with a specific gravity of 1.016, and it contained about one-sixth of albumin. She said that she had suffered for some years from diarrhœa, and that for the past few months she had lost all control over her bowels. The patient died three days after a left lumbar colotomy had been performed.

The post-mortem examination showed that all the organs were very fatty, but there were no gummatous deposits to be found anywhere, nor any strictly syphilitic lesion, except in the rectum and vagina.

The specimen preserved in the museum of St. Bartholomew's Hospital (No. 2057b) consists of the rectum and sigmoid flexure. The bowel is much thickened from the anus upwards, and its cut edge almost resembles cartilage. The thickening diminishes gradually until it becomes imperceptible at the sigmoid flexure. There is hardly any epithelium covering the diseased portion of the intestine. A microscopical examination of a portion of the intestinal wall, taken about 1.4 inches above the anus, shows that the epithelial lining is entirely absent. The submucous tissue is so infiltrated with round cells as to look like a section of lymphatic gland. The muscular coat is also invaded by lymph corpuscles and a dense fibrous meshwork, whilst the outer peritoneal coat is infiltrated with cells.

(ii) *Gummatous Ulceration*. — Gummatous ulceration is characterised by deep ulcers with sharply cut edges, begin-

ning just inside the anus, and extending upwards for a considerable distance. The ulcers have yellow indurated bases, whilst the wall of the rectum, in their immediate neighbourhood, is thickened, stiff, and inelastic, so that a stricture is easily produced if any considerable portion of the bowel becomes involved. The lymphatic glands in the sacrum are often enlarged at an early period.

The inflammation begins three or four years after the patient has contracted syphilis, and more often in women than in men. Pain and weight are complained of in the region of the sacrum, with tenesmus and the frequent passage of stools containing stinking and sanious pus. The sphincters become relaxed after a time, and the discharge, which was at first under control, then becomes involuntary. The constant discharge from the rectum leads to much irritation, and to some inflammation of the skin in the neighbourhood of the anus.

#### E.—TUBERCULOUS ULCERATION OF THE RECTUM.

Tuberculous ulceration of the rectum is usually seen in patients who are suffering from phthisis, though it is sometimes primary. The tuberculous nodules soften, disintegrate, and leave ulcers, which coalesce to form extensive raw surfaces, which may involve the whole circumference of the bowel, the base and edges of the ulcer being studded with tuberculous nodules. The ulceration, like other tuberculous processes, involves the surrounding tissues, so that perinæal abscesses and fistulæ are usually formed.

#### F.—MALIGNANT ULCERATION OF THE RECTUM.

Cancer of the rectum is a condition too well known to require any extended consideration. The following case, however, is interesting, on account of the youth of the patient :—

*Case IX.*—A young man, aged 22, was sent to me on 28th July, 1908, by my friend, Dr. H. D. Everington, saying that he had an ulcer of the rectum which was probably carcinomatous.

Examination showed a well-grown young man of rather sallow complexion, who said that he had been leading an easy life in the house of his father and mother, who were both alive and well. He had suffered no discomfort until a few days previously, when he had become constipated, and had passed some offensive discharge by the bowel. A closer cross-examination brought to mind that he had passed some mucus about a year before, though it was evident that he had not experienced any troublesome symptoms. There were a few cutaneous piles, but otherwise the anus



was healthy, and the mucous membrane of the rectum, in its immediate neighbourhood, was natural. Two inches from the margin of the anus there was the lower border of an oval ulcer, situated upon the posterior wall of the bowel. The ulcer measured about half an inch across; the edges were irregular, and the lower border was indurated. Immediately above the ulcer was an elongated and hard swelling, lying in the middle line, and attached to the front of the sacrum.

The diagnosis lay, I thought, between a dermoid, which had caused ulceration of the rectum by pressure, and a cancer at an unusually early age, which had involved the sacral glands. In either case it seemed undesirable to wait, and I therefore removed the coccyx, cut away a part of the sacrum, and excised the mass which lay in its hollow. It proved to be an enlarged lymphatic gland, and subsequent examination showed it to be infiltrated with adenoid cancer. A week later I performed a left inguinal colotomy, and, a fortnight afterwards, I excised the rectum with a good margin of healthy tissue on both sides of the ulcer. The patient made a good recovery from the operation, and was able to go about his duties for a few months, but I am told that he is now suffering from a recurrence of the disease which involves the sacrum.

#### CLASSIFICATION.

A consideration of these cases enables chronic ulceration of the rectum to be classified as follows:—

|                                      |                        |                                     |
|--------------------------------------|------------------------|-------------------------------------|
| Chronic ulceration<br>of the rectum. | Ulcerative<br>colitis. | Dysenteric { Sporadic.<br>Epidemic. |
|                                      |                        | "Syphilitic."                       |
|                                      | Syphilitic             | Tuberculous.                        |
|                                      |                        | Secondary to pelvic<br>cellulitis.  |
|                                      | Tuberculous.           | Gummatous.                          |
|                                      | Carcinomatous.         | Ano-rectal syphiloma.               |

It will be noticed, in this classification, that I have laid considerable stress upon the part played by infective colitis in producing chronic inflammation of the rectum. It used to be the custom for surgeons to classify ulceration of the rectum into malignant and syphilitic inflammation. The more correct classification of the latter group is, I think, the one given above: ulcerative colitis occurring in those who have had syphilis, or who are suffering from tubercle, or who have an inflammatory condition of the pelvic connective tissue dating from labour. On the one hand, these inflammatory conditions would, in all probability, have subsided, if the patient had not become infected with the micro-organism leading to ulcerative colitis; on the other, if the tissues had been perfectly sound,

it is probable that the infective agent would never have effected a lodgment.

#### DIFFERENTIAL DIAGNOSIS.

Ulcerative colitis, so far as it is known at present, occurs during adult life in those whose general health is lowered. It is best known in the form of "asylum dysentery," for it is almost endemic in some of the large asylums in this country ; but it also occurs in isolated cases, like those which came under my care, and, so far as is known at present, without exposure to any recognised source of infection. It begins insidiously as a diarrhoea, and runs a course, which is either acute or chronic, sometimes leading to perforation of the bowel in one or more places, but more often without perforation. The prognosis is extremely bad when there is marked ulceration, although, in the earlier stages, its course can be arrested by suitable means in those who are otherwise healthy.

The conditions of lowered vitality which attend ulcerative colitis were known before the disease itself was recognised. Dr. Bright, in one of his early and classical papers on albuminuria ("Tabular View of the Morbid Appearances in 100 Cases connected with Albuminous Urine," *Guy's Hospital Reports*, April, 1836, p. 385), records that Margaret Field, aged 40, died with anasarca, comatose. The kidneys were hard, rough, and lobulated ; the liver was somewhat fatty, and the large intestines were ulcerated throughout. The colon was also ulcerated in five other cases in this series (Nos. 42, 51, 55, 68 and 79), and, with a single exception, all these cases occurred in women. Dr. Bright also took special notice of the association of intestinal ulceration with renal disease, for he said (page 399) : "The intestines have in several instances, though not very generally, shown naked-eye signs of disease. In about nineteen cases the small intestines have been irritated in some portion of their course ; in a few of these, ulceration has taken place, and in seven instances the colon or cæcum has been diseased ; but several of these occurred in conjunction with tubercles in the lungs, and have, therefore, been scarcely ascribable to the peculiar circumstances of the disease."

One of my own cases had interstitial nephritis, another had been cured of a fistula, a third bore evidence of instru-

mental delivery. The museum specimens, to which I have referred, show that one of the patients had suffered from a recto-vaginal fistula, another had suffered from pelvic cellulitis, whilst another had advanced phthisis in addition to a syphilitic infection. I think, therefore, that it may be safely assumed that these cases of chronic inflammation are due to a local infection of the micro-organisms causing ulcerative colitis, which is grafted upon tissues specially prone to be attacked owing to their previous unhealthiness. If this is the case, it explains why women are more prone than men to chronic ulceration of the rectum, as is certainly the case. All the cases here recorded occurred in women, and each of these women had borne children, some legitimately, others illegitimately. In many of the cases parturition had occurred after the patient had suffered from symptoms of ulceration of the bowel, either tuberculous or syphilitic. It may, therefore, be safely assumed that chronic ulceration of the rectum is more frequent in women than in men, because of the additional strain placed upon the pelvic tissues during labour.

The symptoms of ulcerative colitis are not very serious even when the inflammation has lasted for some length of time, and they are quite out of proportion to the severity of the disease. The patients whom I have made the text of these remarks were curiously alike. They were ill, yet they only seemed restless and apathetic. They were anæmic, but had not lost flesh to any great extent, and they presented very few of the ordinary facial aspects of advanced disease. They took the food that was offered to them, and allowed everything to be done for them quite passively. It even crossed the minds of some of my dressers to ask whether they were not lazy people, who were making the most of an attack of diarrhœa, which had lasted somewhat longer than usual. Examination with a sigmoidoscope set their minds at rest on this point, and showed the seriousness of the condition from which the patients were suffering. The anus had lost its tone, and, as soon as it was dilated, a large quantity of foul-smelling discharge escaped from the bowel. The mucous membrane was ulcerated, and the ulceration extended as high as the instrument could be passed. The mucous membrane between the ulcers formed polypoid masses, and the blood-vessels were so delicate that they bled easily whenever they were touched. There was no evidence of healing, and the edges of a fistula which had been



laid open in one of the cases showed, after a time, the callous appearances often seen in the most chronic form of varicose ulcer.

The appearances presented by ulceration of the rectum due to syphilis are wholly different. Syphilitic ulceration of the rectum is usually gummatous. It begins in the submucous tissue, and may be either nodular with a tendency to caseate, or diffuse, when it is often sclerosing in character—that is to say, the submucous tissue, and, at a later period, the muscular walls of the bowel become infiltrated with fibroid tissue which undergoes cicatrisation. The walls of the bowel feel rigid as far as the finger can reach, and the lumen is narrowed sometimes to such an extent as to produce a true stricture. The interference with the blood- and lymph-supply leads to a diffuse ulceration of the mucous membrane, in much the same way that a chronic syphilitic inflammation of the tibia leads to a chronic ulceration of the leg. This condition occurs, so far as we know, in men as often as in women, but only in those who have had syphilis and who bear other traces of tertiary lesions. In the majority of cases, syphilitic inflammation extends upwards from the anus into the rectum. It does not, therefore, run nearly as high as the ulceration in ulcerative colitis, and there is no area of healthy mucous membrane inside the anus, as is not unusual in cancer. The ulcers are more or less defined by irregular edges, which are ashy-grey in colour, and they have a sloughing base. Fissure-like cracks sometimes replace the ulcers. These fissures lie between the anal folds, the folds themselves being of a sodden and whitish appearance, whilst the whole ulcerated surface is moistened by a thin and fetid secretion, which is very different from the abundant and stinking discharge which pours from the anus in ulcerative colitis.

Syphilitic inflammation is not very painful, and it is, therefore, allowed to continue without treatment for long periods of time. Stricture of the rectum is a consequence of this neglect, and the patient may seek advice for the stricture rather than for the ulceration and inflammatory processes which led to it. In such cases the stricture differs from the narrowing of the bowel which occurs in ulcerative colitis. In syphilitic inflammation the stricture is narrow, tubular, and of considerable length. It is due to cicatrisation of all the coats of the rectum, and it is, therefore, hard and dense. In ulcerative colitis, on the other hand, the narrowing of the bowel is confined to the

mucous and submucous coats, so that the constriction is more easily dilatable. It is, in fact, due rather to a tonic contraction of the muscular coats of the bowel than to any organic stricture, as was well shown in the first and fourth cases in my series, where a stricture, which had been well marked whilst the patient was only chronically ill, disappeared shortly before death, and was wholly undiscoverable at the post-mortem examination.

Cancerous ulceration of the rectum is too well known to require prolonged consideration. The case I selected was chosen purposely on account of its rarity, and as a warning not to allow considerations of age to exclude a diagnosis of cancer. A young man, aged 22, leading a quiet and healthy life at home, had suffered so little discomfort that he only sought advice when the ulceration of his rectum had attained considerable proportions, and the sacral glands were distinctly enlarged. The story, except for the youth of the patient, is not uncommon. It proves that the rectum is not very sensitive to inflammatory processes situated at some distance above the anus. It is not until the constriction leads to obstruction, or the ulceration causes a discharge of blood and mucus, that the attention of the patient is drawn to his condition, and in a young patient, with a powerful sphincter, any increased secretion of mucus may be readily retained in the rectum until it is passed unnoticed at stool.

Cancer of the large intestine occurs in two typical forms: the one a narrow, sclerosing band, which kills by cicatrising, until the lumen of the bowel is so narrowed as to produce intestinal obstruction; the other, a fungating and ulcerating mass, which may involve the whole circumference of the bowel, or may be limited only to a single portion. The fungating form is the more common in the rectum, and the characters of the cancerous ulcer are then sufficiently characteristic. It is usually situated at some distance above the anus; healthy mucous membrane covers the distal end of the rectum, and it may lie so high in the bowel that it can only be felt when the patient strains, or when a sigmoidoscope is used. The growth has commenced in the mucous membrane, and rapidly invades the submucous tissue and the muscular coats. The walls of the rectum are, therefore, thickened irregularly, but as the disease is confined at first to the bowel, it is movable on the surrounding parts, and the bowel can be drawn downwards.

When ulceration has occurred, the edges of the ulcer are raised and indurated, leading in some cases to narrowing of the lumen, in others, to an increase in its size by the destruction of the tissues. The ulceration has started from a definite point, and has spread by a simple process of extension; it is, therefore, tolerably well localised to the immediate neighbourhood of the cancerous growth, and, as the mucous membrane above it is œdematous and a little prolapsed, the impression received by the examining finger is similar to that given by the os uteri, when a vaginal examination is made. The lymphatic glands lying in the sacrum may or may not be involved at quite an early period in the disease.

The symptoms are sometimes so slight as to render the diagnosis difficult, because there is nothing sufficiently urgent to make a rectal examination imperative. A little diarrhœa, after a temporary attack of constipation, some feeling of fulness in the bowel, the appearance of a few piles, may alone give warning of the interference with the functions of the rectum. It is desirable, therefore, to be always on the alert and to make a rectal examination in every case, in which there is the least suspicion of rectal weakness, though it is often difficult to obtain the patient's consent.

#### TREATMENT.

The treatment of chronic ulceration of the rectum is naturally a matter of great importance, and it has lately undergone considerable change. The older surgeons believed that every case of chronic ulceration of the rectum was due to dysentery, tubercle, syphilis, or cancer. Cases of dysentery without abscess of the liver, which are now called ulcerative colitis, were regarded as syphilitic, because these cases are sometimes curable by mercury, and surgeons fell into the fallacy known to logicians as the Undistributed Middle. They argued: "All syphilitic ulcers are cured by mercury; this ulceration is cured by mercury; therefore, this ulceration is syphilitic." But the fallacy had the excuse that bacteriology had not—and has not yet, for that matter—advanced sufficiently to assign a specific organism to the condition known as ulcerative colitis, whilst it was clearly not dysentery of the type with which surgeons had been familiar in the tropics. It was not so acute, there was much less mucus, and there were no abscesses of the liver. It occurred



too, in patients who had never been out of England, or far away from the village community where it was known that there were no other cases.

Patients who are suffering from ulcerative colitis should be treated by medical means in the earlier stages of the disease, because many of the sporadic cases can be cured, if they are taken in hand at once. The general lines of treatment are to prevent the accumulation of discharges in the rectum, to soothe the irritated state of the bowel, and, if possible, to prevent the multiplication of the infective micro-organisms in the mucous membrane.

The patient is to be kept in bed, and given 1-drachm doses of sulphate of magnesium every hour, with the object of promoting a flow of lymph towards the intestinal walls, which will perform the same function as does the increased flow of blood through an inflamed part, produced by the application of a fomentation. The rectum is also to be well flushed out daily with an enema of boric lotion, or salt solution, at a temperature of  $105^{\circ}$  F., whilst every other day the enema is altered to one containing 10 grains of nitrate of silver in a pint of distilled water. If these means fail, they should not be persevered with in the hope of improvement, as the condition is progressive, and becomes more serious with lapse of time. It is better to discard them entirely at the end of a week or 10 days, unless there is marked improvement. Mercury may then be given in the form of calomel in a single dose of 10 grains, followed by 3 to 5-grain doses, if the drug seems to cause improvement. The ulceration cleared up rapidly in one of my patients, when mercury was given in the form of a suppository. Ten-grain doses of tannigen are sometimes useful, and chlorodyne is serviceable when there is much tenesmus. It can be given in 10-minim doses with 20 grains of oxycarbonate of bismuth in an ounce of chloroform water. Dr. Gemmell, of Preston, who has had a large experience of asylum dysentery, speaks very highly of quinine. He "throws in the bark," as the old physicians used to say, in a single dose of 15 grains of sulphate of quinine, and repeats it in four hours, if the temperature has not fallen, and he then gives 5-grain doses until the symptoms subside. Quinine appears to be especially useful when the ulceration is associated with a high temperature. Dr. Gemmell also speaks highly of enemata containing 1 or 2 drachms of salol dissolved in

turpentine and added to each pint of hot water. He also thinks that sulphate of iron and sulphate of copper may be used advantageously in the form of enemata, because these salts disinfect the bowel, and have a stimulating effect upon its wall.

Dr. E. L. Dunn (*The Lancet*, vol. I., 1909, p. 500), of the Berkshire Asylum, Wallingford, recommends the use of creasote and cod-liver oil in the treatment of ulcerative colitis. He orders creasote three minims, and cod-liver oil one drachm, to be taken three times a day on the first day of the disease, castor oil having been previously administered to the patient. The remedy is increased gradually by doses of one drachm a day until the maximum is reached on the fourth day, when the patient is taking twelve minims of creasote and half an ounce of cod-liver oil three times daily. This dose is continued until the patient is cured.

Ipecacuanha does not seem to yield the same good results in the treatment of ulcerative colitis as it does in true dysentery. It is not worth while, therefore, to do more than give the drug a short trial when other means have failed to afford relief.

Dr. Curtis Webb reports benefit from the use of electric enemata in cases of ulcerative colitis. After a preliminary lavage of the bowels, one pint and a half of a solution of nitrate of silver 0.1 per cent. is injected through a rectal tube, in which is a copper wire connected with the positive pole of a battery. Large clay electrodes are placed on the back and abdomen, and connected with the negative pole. A current of from 15 to 20 milliampères is passed for 15 minutes, and the application is repeated from time to time until the patient is cured. Mr. F. C. Wallis and Dr. Ironside Bruce have also obtained good results from zinc kataphoresis in the treatment of ulcerative proctitis.

Both methods are worthy of a trial in the slighter cases, in which the ulceration is limited to the lower part of the bowel. But, as soon as medical means have proved themselves incapable of curing the patient, operative treatment should be adopted. The formation of an artificial anus in the descending, transverse, and ascending colon have been tried successively, and each has been found wanting. Appendicostomy, as suggested by Mr. C. B. Keetley, is now on its trial, and affords promise of much better results than have been hitherto obtained, for by this means the whole of the large intestine can be thoroughly flushed without undue irritation or discomfort.

THE RÔLE PLAYED BY DIET IN  
BRIGHT'S DISEASE.<sup>1</sup>

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DIET plays an important part in the treatment of Bright's disease.

By variations in the quality and quantity of food the composition and amount of urine can be directly influenced, and hence the work of the kidneys may be modified or lessened at will. The influence of diet on the kidney must be considered currently with its influence on the circulatory system; since the functions of the latter are so commonly disturbed in renal disease, and, as probably all forms of Bright's disease are the result of some toxæmia, we have to deal with an organism the metabolism of which is profoundly modified, and in which the actual renal lesion is often only one, though perhaps the most marked effect of the pre-existing toxic condition.

Consider the multiform actions of the poisons of scarlatina, diphtheria, gout, and lead.

With the advent of the renal lesion, further alteration in the general metabolism, giving rise to the clinical signs of uræmia, may occur. There must be a prophylactic hygiene directed against Bright's disease, but when the disease is recognised, the principles of treatment are three :—

- (1) To protect and rest the renal tissues.
- (2) To relieve and sustain the heart.
- (3) To maintain an efficient nutrition of the patient.

In the endeavour to satisfy one of these demands, the claims of the others must be duly recognised. The diets chiefly to be considered in the treatment of renal disease are :—

- (1) The amount of fluid.
- (2) The pure milk diet.

<sup>1</sup> A paper read before the North Wales Branch of the British Medical Association.



- (3) The lacto-vegetarian diet.
- (4) The chloride poor diet.
- (5) The nitrogen poor diet.
- (6) Special articles of diet.

1. *The Amount of Fluid.*—In acute nephritis, and acute exacerbations of chronic parenchymatous nephritis with dropsy and scanty urine, it is a common-sense view which attributes the lack of urinary water to impermeability of the diseased organ, and the view is strengthened by the fact that, on microscopic examination, the glomeruli are invariably found to be diseased.

If this is so, to give an excess of water is in direct contravention to the first of the principles stated. Water in these cases is not excreted, and simply serves to further augment the œdema and hydræmia. The work of the heart is increased, and a primary compensatory hypertrophy may pass into the stage of dilatation feebleness.

The removal of the dropsy by vapour baths and mechanical means is rapidly followed, in many cases, by diuresis, and the amount of fluid given in this condition need not exceed from 2 to 2½ pints. Von Noorden, in some cases, reduces the fluid intake to a minimum. He quotes a case of a boy, æt. 11, in whom the urinary water measured only 120 c.c. One litre of milk and 800 c.c. of Fachinger water were allowed; this was continued for 4 days, when the fluid intake was still further limited, and only pieces of ice were allowed to be taken. In four days the urinary water had reached 890 c.c.; 500 c.c. of milk were then added, and the output of water rose to 2,350 c.c. These are cases of nephrogenic dropsy, and not merely the water, but also the toxic retention are to be considered. If the quantity of fluid is increased, it is desirable to remove the dropsy partly by mechanical means, since, in spite of old traditional teaching, there is little, if any, evidence that nitrogenous substances are eliminated by the skin. If the former method of treatment is neglected, increase of fluid will merely dilute the tissue fluid without diminution of the sum total of toxic material. In the cases of chronic parenchymatous nephritis and granular kidney without dropsy, the problem is somewhat different. Here water is excreted, acts as a diuretic, and must be regarded to a certain extent as an anti-uræmic

remedy. Its danger is lost by overloading the circulatory system, cardiac weakness is precipitated, and cardiac dropsy engendered, associated with attacks of cardiac pain, arrhythmia, etc. It is in these cases that especially Von Noorden and his school have advocated a sensible restriction of fluid, even when the heart is strong. He limits the fluid intake to  $1\frac{1}{4}$  litres a day, including everything taken in the liquid form. Assuming that 5-700 c.c. are contained in the solid food, the urinary water output under this regime reaches about 1,300 to 1,500 c.c. He has found that this does not diminish the amount of solid matter in the urine, but should this occur, he allows free ingestion of fluid about once a week. When early symptoms of loss of cardiac compensation occur, H. Strauss also diminishes the amount of fluid, and insists that this should be taken in small, frequently repeated amounts. Should uræmic symptoms threaten, Strauss doubts the efficacy or wisdom of restricting the fluid intake, and rather relies on rest to restore the cardiac force.

Huchard, writing on arterio-renal sclerosis, points out that the last stage of this disease is associated with a condition of hypo-systole, with dropsy of the tissues and of the viscera, which is not relieved by either cardiac tonics or diuretics. He considers that in such cases, the only chance of saving life is by the substitution of a dry diet for a fluid one. Hence the amount of fluid to be given in the more chronic forms of renal disease depends upon the relative urgency of renal inadequacy, and the power of the heart.

2. *The Milk Diet.*—This is the ancient and traditional diet in renal disease, and in most cases of acute nephritis, milk must be the chief article of food. It offers many advantages. It is a complete food, is easily digested, and it does not cause alimentary fermentation except perhaps lactic-acid fermentation, and this may even be advantageous in causing a diminution of other intestinal microbic processes. It favours diuresis on account of its water, certain of its salts, and its lactose, and it is relatively poor in sodium chloride. Many patients with acute Bright's disease do perfectly well on a pure milk diet,  $2\frac{1}{2}$ —3 pints of milk, which may be slightly diluted, and to which sodium citrate or sodium bicarbonate may often be added with advantage. As a food it has certain

disadvantages :—

(a) In order to obtain a caloric value of food equal to 2,400, which is about that required for an adult man of 65 to 70 kilogrammes weight, a patient must take  $3\frac{1}{2}$  litres of milk, which contain no less than 137 grammes of albumin, corresponding to nearly 22 grammes of nitrogen. This is almost double the amount of nitrogen that is necessary in health, and certainly far more than it is desirable to give a patient with an acute renal lesion. In order to overcome this difficulty, Von Noorden prescribes a food of 1,500 c.c. milk and 450 c.c. of sterilised cream, the food value for which is about 2,100 calories, made up of 55 grammes of protein, 70 grammes of milk sugar, and 165–170 grammes of fat. The excess of fat in ordinary milk may also render its prolonged use undesirable.

(b) It is poor in iron—too rich in phosphorus. Gauter has estimated that the required amount of iron is .04 gramme per diem, whereas  $3\frac{1}{2}$  litres of milk only yield .012 gramme. The same author states that the phosphorus, in an equivalent milk diet, is nearly double that required in health. Von Noorden, from experiments, placed phosphoric acid as one of the substances which is with difficulty excreted by the kidneys. Its elimination by the kidneys can, however, be prevented by adding a small quantity of calcium carbonate to the milk. In these circumstances, the phosphoric acid unites with the calcium in the intestines, and is not excreted by the kidneys. Milk itself contains a large amount of calcium, but it is already in combination, and cannot combine with the phosphoric acid. Analyses confirm this, for after the addition of calcium carbonate less phosphoric acid is excreted in the urine.

(c) Another difficulty sometimes is that an exclusively milk diet is badly tolerated, and causes great distaste for food. Constipation, forms of dyspepsia, and anæmia may also ensue from its prolonged use.

3. *The Lacto-vegetarian Diet.*—In such cases it is well to add substances such as rice, arrowroot, sago ; these are foodstuffs which are poor in sodium chloride and proteids, but rich in carbohydrates, and hence supplement a milk diet. Gouget recommends 2 litres of milk, 250 grammes of rice, and 250 grammes of grapes, 750 c.c. of Vals or Vichy water may be used with any excess of milk.



A milk diet in its modifications, as just mentioned, is suitable for an acute nephritis, whether this is the primary affection, or an acute exacerbation grafted upon an old lesion. This last event is quite common, and it is an error not to recognise the pre-existing old lesion, lest the milk diet should be continued to undue length in the hope of curing the disease. If a pre-existing chronic nephritis exists, this cannot be achieved, and a diet containing a much greater variety of foodstuffs should be substituted. The length of time the milk diet should be continued is determined either by the onset of healing of the kidney lesion, as indicated by the disappearance of the dropsy, the free diuresis, the diminution of the albuminuria, and the increase in the urine of nitrogen and chlorides, or, on the other hand, by the unwelcome signs that the disease is becoming a chronic irreparable lesion. In either of these events, small quantities of meat or eggs may be added, provided that the total protein intake does not amount to more than 100 grammes.

4. *The Chloride Poor Diet.*—An enormous literature has sprung up around the question of the rôle played by sodium chloride in the problem of dropsy, uræmia, and arterial hypertension. Critical analysis shows that many of the statements made cannot be supported. The chlorides, which are found in the urine, in the form of sodium chloride, are derived directly from the food. Salt, which is ubiquitous, is necessary to animal life, and the body tissues are bathed in a fluid which contains about 0·5 per cent. of NaCl.

In health the renal activity maintains this level, and hence arises the variations in its excretion, until equilibrium is established. In many cases of Bright's disease this equilibrium is maintained as in health, in some it is unduly delayed. Pure water does not enter the tissues as such, it always contains organic and inorganic substances in solution; hence with œdema, there must be retention of such substances and *vice versa*. The primary event may be the retention of water due to renal incapacity, to weakness of the circulation, or to abnormal perviousness of the vessels. The water thus retained requires NaCl in order to balance the osmotic pressure of the blood. Hence the output of NaCl is diminished. On the other hand, the deposit of the NaCl in the tissues may be

primary, perhaps owing to an alteration in the tissues themselves, and these therefore attract water, and set up œdema. Marie's hypothesis is that there is a *cholure fixé*, in which the NaCl is chemically fixed by the tissues themselves. It occurs in the preliminary stages of œdema, and may persist even after the occurrence of a diuresis; but when the tissues become saturated, the chlorides accumulate in the tissue fluid, and œdema follows. This is the *cholure libre*.

Strauss considers that a chloride-free diet is indicated in cases of renal compensation failure, which are characterised by diminution of urinary water, a cloudy appearance of the urine, a high albumen content, a richness in cellular elements, and a poverty in chlorides, and in which the body-weight increases, with or without œdema; for it must be remembered that there is a kind of invisible œdema, an œdema of the deeper tissues, or interstitial œdema, and that the disappearance of this can only be recognised by the diminution of the patient's weight, and also by an increase in amount of urinary chlorides.

Strauss therefore finds the use of this form of diet, chiefly in examples of chronic parenchymatous nephritis, with obvious œdema, and in threatened dropsy, or tendency to dropsy. In other cases, he does not adopt a continuous chloride-free diet. When a moderate amount of urine is excreted, and the chlorides are not considerably diminished, and the patient is not increasing in weight, then the diet need not be very poor in chlorides, but these should not exceed in amount 10 grammes per diem. On no account should the water intake in Bright's disease be diminished, unless, at the same time, a salt poor dry diet is selected. The following figures were obtained by me in a case of acute nephritis with delay in the healing of the kidney lesion. A boy, æt. 12, admitted with great dropsy, was placed on a salt poor diet of milk, cream, rice, and water. In this period, the analysis on two days showed respectively a water output of 624 and 766 c.c., with NaCl totals of only 1 and 3.8 grammes. Temporary diuresis was established, 1,590 c.c. of water, with 8 grammes of salt, then again a period of some water and salt retention for a week, ending in a water output of 908 c.c. with 2.25 grammes of salt, followed by a more permanent diuresis, disappearance of the dropsy,

and a salt output equal to 14·7 and 10·9 grammes of NaCl per diem.

In compensated granular kidney on a constant diet, the salt output is very constant, and so also in chronic parenchymatous nephritis with a tendency to dropsy, salt equilibrium may be well maintained, but occasional analysis is desirable, for a salt retention may be associated with increase of weight and the occurrence of the invisible dropsy, or dropsy of the deeper tissues.

A healthy man on ordinary diet excretes about 12-17 grammes of salt a day; this is undoubtedly far more than is required for the needs of the body, which, indeed, Richet and Bunge reckon as not more than 3 grammes. But the precise limitation of the use of a chloride poor diet must be recognised, and when one finds, in these cases of nephritis, that adequate elimination follows ingestion, the amount of salt may be increased.

5. *The Nitrogen Poor Diet.*—This diet is indicated when it may be considered desirable to spare the work of the diseased organ. The protective principle can obviously be carried further in the acute than in the chronic disease. According to Von Noorden, the nitrogenous bodies—urea and creatinin—are excreted with difficulty in parenchymatous nephritis, whilst the purin bodies—uric acid, xanthin bases, and ammonia—are well excreted. Creatinin is only present in meat extracts broths, etc., and these should therefore not be used. Von Noorden considers cases of acute nephritis under three conditions:—

(a) Severe cases with anuria and oliguria, in which the oedema is increasing, and there is danger of uræmia. Here he limits the diet to the smallest possible quantity, about half a litre of milk a day. Fluid should be avoided as much as possible, ice given to allay the thirst, and the water removed from the tissues by diaphoresis. Four or five days is the longest period for which such a diet can be tolerated; but this is usually sufficient for at the end of that time the patient either succumbs to uræmia, or develops symptoms which point to increased functional activity of the kidneys.

(b) Cases in which the secretion of urine is reduced, but in which uræmia does not threaten and there is only moderate



œdema. In this stage, he advises the milk and cream diet to which I have alluded, viz., 1,500 c.c. of milk and 450 c.c. of sweet cream. If the patient is reduced, substances of a small proteid but high caloric value, such as rice, oatmeal, butter, sugar, and fruit syrups, may be added. When convalescence is delayed with such diet, I have used with advantage, for a period of a few days, a diet of carbohydrates and fluid only, glucose 6 oz., cream 6 oz., and fruit; the albumin diminishes, and the diuresis not infrequently occurs.

(c) The convalescent stage of acute nephritis. The diet may be increased to  $2\frac{1}{2}$  litres of milk (= 80 grammes of protein), and bread, peas, beans, rice, or potatoes may be added, and perhaps an egg or a small quantity of meat, but always in such quantities that the amount of ingested protein does not exceed 100 grammes, when about  $2\frac{5}{8}$  grammes of urea should be excreted.

In the treatment of chronic conditions, these principles cannot be applied. The essential postulates are to protect the kidneys from noxious influences, to strengthen the whole organism, and to spare the heart, and strengthen its muscles.

There are three groups of cases:—

1. The compensated kidney, where the excretion of urinary products is not greatly interfered with.
2. The acute exacerbations, when the treatment resembles that of acute nephritis.
3. The hopeless cases, when the desires of the patient should be met as far as possible.

6. *Special Articles of Food*.—Meat may be given, and the old idea that eggs or red meats are injurious has not been substantiated. The urinary output should not fall below 12 grammes of nitrogen (= 25 grammes of urea), which requires about 85–90 grammes of protein, allowing for nitrogenous loss through the fæces. Strong broths and extractives should be forbidden. Alcohol is in general to be forbidden; its transitory uses are indicated when there is lack of appetite and disturbance of the heart. A small amount of champagne in the evening may prevent the nightly attacks of uræmia and cardiac asthma, but it should be forbidden as a table beverage. It threatens the heart and the walls of the blood vessels.

Coffee, tea, and tobacco are irritants, and must only be

permitted with great caution, when it is shown by observation that they do not increase the frequency of the pulse, the intensity of the cardiac impulse, or cause unpleasant subjective sensations. Spice, pepper, ginger, and mustard are harmful, but salt and a small amount of vinegar may be taken.

TABLE GIVING THE NITROGEN VALUE OF CERTAIN FOODS,  
FROM V. HARLEY, GOODBODY, AND CHITTENDEN.

| Amounts of 1 oz. unless<br>otherwise stated. | Grms.<br>Nitrogen. | Calories. | —  |
|--|--------------------|-----------|--|
| Plaice, cooked - - -                         | ·93                | 25        | <i>Note</i> —In urinary analysis the hypobromite method estimates the total N. in the urea and ammonia and partly that of other constituents.  |
| Whiting, cooked - - -                        | ·78                | 24·8      |  |
| Sole, uncooked - - -                         | ·73                | 22·9      |  |
| Beef, roast - - - -                          | 1·16               | 38·7      |  |
| Mutton, roast - - -                          | 1·22               | 65·1      |  |
| Chicken, roast - - -                         | 1·14               | 38·2      |  |
| 1 egg, boiled - - -                          | 1·2                | 94        |  |
| 1 egg, raw - - - -                           | 1·25               | 86        |  |
| Cabbage, cooked - - -                        | ·16                | 8         |  |
| Spinach, cooked - - -                        | ·27                | 23·2      |  |
| Potato, uncooked - - -                       | ·95                | 23·4      | It is in general a fairly safe clinical guide as to the relationship between N. intake and output, and enables the observer to check the statements of his patients with regard to their diet. |
| Potato, 1 small baked, = 2 ozs. -            | ·65                | 55        |  |
| Potato, 1 teacup mashed - - -                | ·53                | 175       |  |
| Cauliflower - - - -                          | ·22                | 18        |  |
| Rice - - - - -                               | ·32                | 99        |  |
| Oatmeal, uncooked - - -                      | ·49                | 116       |  |
| Milk - - - - -                               | ·17                | 19·5      |  |
| Rice pudding, 1 oz. rice, 1 pint milk        | 3·68               | 48·6      |  |
| Butter - - - - -                             | 0                  | 213       |  |
| Butter, 1 cb. inch - - -                     | 0                  | 142       |  |
| White bread - - - -                          | ·36                | 57·4      | It may be useful to remember that 1 grm. of protein or albumin = ·16 g. N. and 1 grm. of urea = ·46 N.   |
| 1 lump sugar (10 grm.) - - -                 | 0                  | 38        |  |
| 1 banana (160 grm.) - - -                    | ·36                | 153       |  |
| 1 teacup cream (120 grm.) - - -              | ·49                | 206       |  |

The following are examples of diets poor in salt, from MM. Achard and Vidal:—

A. Milk, 1000 c.c. Potatoes, 300 grms. 2 eggs. Meat, 300 grms. Barley, 200 grms. Sugar, 50 grms. Butter, 40 grms. Calories = 2274.

B. Bread (made without salt), 200 grms. Meat, 200 grms. Legumes, 250 grms. Butter, 50 grms. Sugar, 40 grms. Cal. = 2200.

- C. Potatoes, 1,000 grms. Meat, 400 grms. Butter, 80 grms. Sugar, 100 grms. Cal. = 3132.
- D. Potatoes, 1,000 grms. Meat, 300 grms. Butter, 50 grms. Rice, 125 grms. Cal. = 2595.
- E. Bread (made without salt), 500 grms. Meat, 400 grms. Butter, 80 grms. Sugar, 100 grms. Cal. = 3037.
- F. Bread (without salt), 200 grms. Potatoes, 700 grms. Butter, 50 grms. Milk, 1000 grms. Cal. = 2450.
- G. Bread (without salt), 200 grms. Potatoes, 300 grms. Rice, 100 grms. Sugar, 100 grms. Butter, 25 grms. Cal. = 1889.

Analyses from various sources give the value for the salt contents in the following articles of diet, in parts *per kil. gramme*:—Milk, 1·15. Fresh Butter, 1. Egg, 1·53.

Some forms of flesh foods contain a considerable amount of salt; if boiled in pure water this is much diminished. Average NaCl = 1 per kilogramme of raw material. Rice, 0·1. Potatoes, 0·5. Oatmeal, 0·4. Peas, 0·6.

None of the above diets contain more than 2 grms. of salt.

The chlorides in the urine may be estimated by Mohr's  $\text{AgNO}_3$  method, which gives approximate figures.





A REPORT ON 250 CASES OF SPINAL  
ANALGESIA BY THE USE OF STOVAIN-GLUCOSE  
SOLUTION.

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IN April last year there appeared a communication by one of us dealing with notes of 50 cases of spinal analgesia, the result of work carried out in the Seamen's Hospital, Greenwich. Since that time the method has been systematically employed in that hospital, and it is hoped that the cases here recorded may furnish some information to those who are interested in this branch of surgery, and help at the same time to swell the number of cases already reported in this country, from which, ultimately, useful statistics may be compiled. With the idea of maintaining accuracy in observation and reporting, only such cases are here included as have been submitted to spinal injection by one or other of us, we are therefore alone responsible for whatever failures we have to record. There are included in the series five cases submitted to injection by one of us in private, and two in the Hospital for Women. The hospital cases were not in any way specially chosen, as the method is employed in the ordinary routine of work in certain of the wards at Greenwich. There has, however, been no compulsion as regards the patients, any of whom have been at liberty to refuse the method at will: only one has availed himself of this liberty, he having suffered from rather severe headache after injection on a previous occasion, his case having been one of those already recorded among the first fifty.

The preparation employed throughout the series was, as in these earlier cases, the stovaine-glucose solution advocated by

Barker, which has given results which it is believed will compare favourably with any other analgesic at present in use. The position of the patient during injection has been varied, the injection having at times been performed in the sitting and at others in the lateral position. It has frequently appeared as if the analgesia experienced by patients injected in the former position was liable to variations of depth, duration, and extent, and that these patients were more frequently affected by post-analgesic phenomena, such as headache, nausea, vomiting, etc., than when the lateral position was employed. This question is, however, not by any means settled, but it is undoubtedly the fact that the solution, when injected in the sitting position, tends to remain localised in the extreme lower end of the theca and to refuse to gravitate satisfactorily towards the dorsal region when the pelvis is raised, the analgesia in some of these cases not rising higher than the area of distribution of the eleventh or twelfth dorsal nerve.

More recently, the method we have employed has been the following ;—

The patient is placed upon that side upon which is the area of the proposed operation, the thighs being fully flexed upon the abdomen, and the cervical and dorsal spine being also in a position of flexion. The spinal column is thus arched posteriorly, and the lumbar spinous processes are as widely separated as possible ; at the same time the head end of the table is slightly lowered. The injection is then made through the second, third, or fourth lumbar interspace, a small area of skin being previously frozen by the ethyl-chloride spray. The patient's head is now raised upon a pillow, and he is left in this position for a minute to a minute and a half. At the end of this time he is gently turned over on to his back, the head and neck being well raised. As soon as the analgesia has risen to the required height, the table is levelled, the head and neck remaining raised.

Those cases which have been treated in this manner appear on the whole to have yielded surer and more constant results, and to have been marked by longer analgesia and fewer after-effects than those in which any other method has been employed. On the other hand, one of the cases (No. 229)

submitted to spinal analgesia in the Hospital for Women would appear, at least so far as height of analgesia is concerned, to be a direct contradiction of this statement, and the phenomena are here difficult to explain. With this exception and perhaps with that of two others (Nos. 44 and 246) reported below, it may honestly be said that none of our cases showed any symptoms which could in any way be regarded as alarming; in fact the whole series from this point of view has been quite uneventful.

As regards dosage, the practice in the earlier cases of this series was to employ a dose of seven centigrammes for operations at or above the groins, four to five for perineal or rectal cases, and six for operations on the lower extremities. Latterly, however, amounts in excess of six centigrammes have seldom been given, as it was found that this amount was sufficient for nearly all purposes.

The period elapsing between the injection and the establishment of analgesia at any given level has not varied greatly in different cases, the average being about five to seven minutes for the groins and eight to ten for the epigastrium; but this point again has exceptions, as, for example, the case (No. 229) above referred to, where the whole body was analgesic to the clavicles in less than two minutes. A point of importance has seemed to us to be, that when analgesia attains a great height it does so with marked rapidity; and further, the cases are those in which the flow of cerebro-spinal fluid is unusually active. Where the analgesia has been extremely slow or imperfect, the cause was probably to be attributed to loss of solution in the extradural space, as in such cases a second injection has usually overcome the difficulty. The suggestion put forward by some observers, that analgesia depends largely upon diffusion of the solution in the cerebro-spinal fluid, is probably incorrect; for although diffusion must occur to some extent, the theory could hardly account for the very high and rapid analgesia which is at times met with. Again, in one or two cases in which the analgesia stopped at the groins or the umbilicus, it was found possible, if done within the first fifteen minutes, to obtain a further rise by again lowering the head end of the table,



although the analgesia thus obtained was feeble as compared with that already established. As was noticed in the first series of fifty cases, an imperfect flow of cerebro-spinal fluid was generally the precursor of an unsatisfactory analgesia, and so constant was this found to be the case, that latterly it was considered wiser, when the flow was poor, to explore in a higher space rather than to risk a failure which would compel a second injection.

In hardly a single case was complaint made of pain from the needle puncture, many patients saying that they did not feel it at all, and this at times when ethyl chloride was not employed.

The most constant phenomena consequent upon successful injection were the following; they are given in their usual chronological order:—

- (1) Loss of knee jerks.
- (2) Loss of plantar and cremasteric reflexes.
- (3) Subjective sensations of warmth of the feet; tingling and numbness of the feet and ankles. Analgesia of the perineum.
- (4) Sensation of increased weight of legs.
- (5) Analgesia complete in the penis, scrotum, and rectum.
- (6) Gradual and steady rise of analgesia.

Occasionally the following phenomena have been noticed on the operating table: with one exception they do not appear to depend on excessively high analgesia, since they have been seen with analgesia no higher than the umbilicus. They are, however, more marked with high analgesia as a rule, but at the same time it must be noted, that in one or two cases of analgesia to the clavicles these phenomena have been entirely absent. The one which undoubtedly does depend on high analgesia is the last on the list.

(a) Pallor, nausea, sweating, and now and then regurgitant vomiting, coincident with feebleness of pulse, coming on usually in fifteen minutes from the time of injection and lasting from five to fifteen minutes.

(b) Relaxation of the sphincter ani. This is one of the most annoying results where an aseptic operation is in pro-

gress, but one of the most satisfactory where rectal surgery is in question.

(c) Engorgement of the penis closely resembling that seen in fracture of the cervical spine, but not depending on high analgesia.

(d) Shivering (not amounting to actual rigor since it is unaccompanied by pyrexia) and sensation of being cold.

(e) Respiratory distress as evidenced by "air hunger" and inability to cough, but unaccompanied by any trace of cyanosis. This certainly depends on intercostal paresis from high analgesia, but it does not affect all patients to the same degree, the element of nervous apprehension being much stronger in some than in others.

With regard to sequelæ there has been little to record of any importance. Except in four of the cases headaches have been neither severe nor persistent, and in nearly all cases the trouble has yielded readily to aspirin in ten-grain doses.<sup>1</sup> Vomiting occurred in these cases but was not severe. There has been no undue prolongation of analgesia, gangrene, incontinence, retention, mental disturbance, paresis, or serious paræsthesia. The most constant after-effect was the occurrence of pyrexia; this was present in most of the cases, but rarely ranged higher than 101° F., and disappearing gradually, invariably reached normal in 48 hours. *In no case has there been any sign of post-operative shock.*

Only three deaths occurred in the series, and, as will be gathered from the appended notes, there is no question whatever that none of them were due to stovaine toxæmia.

The sphere of utility of spinal analgesia for operative purposes would appear to be limited, if perfect safety is to be observed, by the level of the fourth dorsal area; unfortunately analgesia to this level does not entirely abolish sensations of dragging, nausea, and discomfort, and perhaps, at times pain, during manipulation of the intestines, stomach, and omentum. Although much may at times be accomplished by delicacy of

<sup>1</sup> It will be noticed that in the later cases of the series, headache has been almost entirely absent. Pyrexia has not been noted as a post-operative complication since it occurs in practically every case.

touch and the avoidance of dragging on these structures, the application of clamps, to the stomach at least, is frequently impossible. In the lower regions of the abdomen and in the pelvis, the analgesia is more perfect, and the appendix may be removed quite painlessly, and, as a rule, uterine operations are quite unfelt. But even here forcible dragging may result in what is described by the patient as "pain under the heart." It is an interesting fact that when such sensations of pain are complained of they are invariably referred to the upper limit of the analgesia, that is, the region of the solar plexus; if the analgesia extends to the level of the first or second dorsal nerves, pain is never complained of in the abdomen. To obtain an analgesia sufficiently high to permit of such operations as gastro-enterostomy, cholecystotomy, etc. being performed, a dose of seven centigrammes of stovaine, is, as a rule, required, and the upper limit of the analgesia must be in the area of the second dorsal nerve. In fact, since the analgesia will pass off in the reverse direction to that in which it was established, if sufficient time is to be allowed for the requirements of the operation, little less will suffice than complete analgesia to the clavicles. This, however, can hardly be considered safe, inasmuch as the whole of the intercostal muscles are to some extent paralysed as evidenced by the inability of the patient to cough, the respiration for the time being depending entirely on the diaphragm. This phenomenon was noticed in one or two of the present series, but in only one, viz., the case of a patient in the Hospital for Women, did it cause any real alarm to the patient herself, and as she was a very nervous subject, and enormously stout and bronchitic, her apprehension is perhaps easily explained. It will be seen from the notes, that many of the patients were analgesic to the level of the fourth dorsal nerve area without experiencing any discomfort; others, however, vomited for a short time, but only in those cases where the analgesia rose to the level of the first dorsal were there any subjective respiratory phenomena.

There would appear to be no grave objection, in cases where the analgesia, once established, has not lasted sufficiently long, or has not risen to the required height, to the practice of resorting to a second or even to a third injection;



the administration is easily carried out even where an operation is actually in progress. The question of dosage is, however, not so easily settled. The factors influencing this must be the following :—

- (a) The amount already given.
- (b) The existing height of the analgesia.
- (c) The age of the patient.
- (d) His condition at the time of injection.
- (e) The period that has elapsed since the initial injection.

Roughly, in an adult, not showing any signs of a toxic nature, with analgesia at the groins, the dose may be two-thirds of that already given ; but if under the same conditions a considerable period has elapsed since the first injection, the full dose may be repeated with safety, but this is seldom necessary. Each case should be judged on its merits, and second doses should rather err on the side of safety.

Stovaine in doses such as have been used in these cases, when it has failed to enter the spinal theca, does not seem to produce any toxic symptoms ; for in certain cases where, although cerebro-spinal fluid was obtained and comparatively large doses were given without any analgesia resulting, it was clear that the solution had for some reason only reached the extra-dural space, there has been nothing whatever in the patient's condition to suggest toxæmia, nor have the nerves passing across that space been affected. Nor when, in addition to these doses, a second injection has been administered within a short period, have any symptoms manifested themselves other than those usually seen in cases in which a single successful injection has been administered. On the other hand, when thrown into the theca, it undoubtedly does at times produce more or less toxæmia, as evidenced by the occurrence of sweating, vomiting, feebleness of pulse, pyrexia, etc., and this toxæmia does not always appear to be proportionate to the dose, nor to the height of the analgesia ; the phenomena are probably dependent to some extent on individual idiosyncrasy.

There have been one or two cases in which, if we are to accept the warnings of certain Continental writers, the use of spinal analgesia was contra-indicated. In one of these the

contra-indication was that of old age with markedly atheromatous vessels; the others, three in number, were suffering from severe sepsis, one of them having a gangrenous foot, a second a suppurating knee joint, and the third multiple sinuses due to pelvic tubercle; none of these cases suffered in any way from the effects of the stovaine.

Such failures as we have experienced have been due either to inability to enter the spinal theca, to insufficient dosage, or to unexplained causes. As regards the first of these causes, failure was due in No. 219 to the fact that the patient, whose spines were very closely set, was suffering from a fracture of the patella, and it was impossible, owing to the presence of a back splint, to separate the spines by flexing the thigh upon the abdomen. In Nos. 22 and 218 the failure must, we think, be attributed to faulty technique, as on a second occasion, when one of these patients required a second operation, no difficulty was experienced in entering the theca. The most interesting failure was that in case No. 88, a boy of 12, who was so acutely ill, having been sent to us on the sixth day of an enteric intussusception, that it was considered impossible to give him a general anæsthetic. The spinal theca was entered, but the flow from it was very feeble; 4 centigrammes of stovaine were injected, but the analgesia only rose to the knees; a second injection of the same amount was given after an equally unsatisfactory flow, and the analgesia attained the level of the upper part of the thigh. Chloroform was then resorted to and the operation was proceeded with. The patient, however, died suddenly on the table as his bandages were being applied, he having recovered sufficiently from the anæsthetic to understand what was said to him. His death was undoubtedly due to cardiac failure, which might, we think, have been avoided had the injection been successful.

Of the series, seven cases require special mention; they are as follows:—

No. 225. In this case, that of a hospital nurse, the analgesia was sufficiently deep and prolonged to permit of the removal of the uterus and a fibroid tumour weighing eight pounds. In most cases the dragging necessary for the completion of such an operation, is felt to some extent by patients, who have

described the sensation, not so much as pain, but as a horrible feeling of sinking. In this case any such sensation was absent although the operation lasted approximately for an hour and twenty minutes. It was also uncomplicated by any sign of shock, or by any toxic symptom.

No. 44. This case was of especial interest, as it was that of a medical man suffering from a recurrent inguinal hernia, and who was interested in spinal analgesia. At the time of operation the syringe was unfortunately broken and the injection was accordingly made by means of an ordinary hypodermic syringe fitted to the usual stovaine needle. The accurate judgment of the dose was consequently a little difficult. 6 centigrammes of stovaine were to have been given, but during the injection, the joint between needle and syringe being badly adapted, some of the solution, probably about 2 centigrammes, was lost; the analgesia rose to the thighs; 3 more centigrammes were given and it rose to the groins. The patient himself then begged for a third injection as he had made up his mind to try the method, and a third dose of 3 centigrammes was accordingly given. The analgesia now rose rapidly to the clavicles and he began to be a little alarmed, there being some sweating, weakness of pulse, and difficulty in coughing. This discomfort, however, passed off in a few minutes. He suffered somewhat severely from headache during the next 24 hours.

No. 105. An elderly man, very atheromatous, who had a stone in his bladder weighing three ounces. After an injection of 6 centigrammes of stovaine his pulse became very feeble, and there was pallor with sweating; his respirations were shallow and only 12 to the minute, although the analgesia only reached the tenth dorsal area. Being a feeble subject with bad cystitis, it was thought wiser to postpone the operation. A week later he was again injected under similar conditions without the supervention of any untoward symptoms whatever.

No. 229. This case, already referred to, was a very unusual one. It was that of an enormously stout woman of 42 years of age, weighing 18 stone, and having a large umbilical hernia for which a filigree of silver wire measuring 7 inches by 4 was



implanted. She was bronchitic and rather cyanosed, especially when placed in the supine position. It was not considered wise to give her a general anæsthetic, and although anything but a promising case, it was resolved to attempt the operation by spinal analgesia. Owing to the impossibility of locating the spines or any other bony landmark, she was injected in the sitting position. The needle entered the theca at the second attempt, but only reached it when the ferrule was sunk deeply in the back. Only 6 centigrammes were given, for although it was thought to be a small dose for such body weight, her cyanosis warned us that a high analgesia might be dangerous. The moment she was placed upon her back, although the pelvis was not raised, she complained of difficulty in breathing and said she could not cough. On examining her with the needle it was found that she was completely analgesic to the clavicles and down the inner sides of both arms, and this at the end of less than two minutes from the time of injection. Her pulse was feeble and she sweated profusely; she was accordingly placed in the semi-recumbent position, and while injections of strychnine and brandy were administered, and a fine stream of oxygen provided, the operation was proceeded with. Her alarming symptoms all subsided in the course of fifteen minutes, and the whole operation, which lasted an hour and three-quarters, was perfectly painless. This is the longest period of analgesia, with the exception of that in Case 4, we have so far met with. There were no after complications of any sort, and the interesting point in the case is the extremely rapid rise of analgesia without the pelvis being raised. As has been said, injections in the sitting position tend rather to low analgesia even when the pelvis is raised, and it is difficult to explain the high level in this case on any other theory than that of diffusion, but at the same time the great rapidity of the rise is against this hypothesis.

No. 4. In this case the largest single dose of the series was given, viz., 8 cg. The patient suffered from a very large hernia on both sides, and it was thought that being a big man, and the operation promising to be prolonged, such a dose would not be excessive. The analgesia rose steadily to the clavicles and passed down the inner sides of both arms, as in the case

just mentioned. The results were not, however, in any way alarming; the patient simply complained that he could not cough, there was no toxic symptoms either at or after the operation. The dose was clearly larger than was necessary, as the analgesia long outlasted the operation, and with more experience it has been found that even 7 centigrammes are rarely required.

No. 226. This patient was also a medical man. He himself chose spinal analgesia rather than general anæsthesia for the removal of varicose veins, and was so satisfied with it that, on the occasion of the operation on the second leg, he again chose it. After the first operation there was a little difficulty in emptying the bladder, necessitating the use of the catheter on one occasion only. In the centre of the inner surface of the right calf there remained throughout the operation a small area untouched by the analgesia of about the size of a sixpence. Pain was felt for some days afterwards in this area, but neither at the operation nor subsequently was it in any way troublesome.

No. 246. In this case there were certainly at one time during operation, which was an amputation through the thigh, marked signs of toxæmia. Although the analgesia only rose to the third dorsal area, the patient began to show signs of failing pulse and shallow respiration during the ligation of the femoral artery, and syncope was threatened; the abdomen was compressed, the other leg was raised and stimulants were given. The condition did not last long, and the patient gradually recovered after some minutes. There were no after-effects, and, with the exception of the attack mentioned, the whole operation was carried out without any trouble, the analgesia being perfect.

In two of the cases of ventrofixation, chloroform was given as well as stovaine, and in one of these the administration was of brief duration, being used simply to tide the patient over the dragging sensation already referred to. In the other it had to be resorted to early, for though the analgesia rose to a good level, the patient was unusually sensitive to this discomfort. It is quite clear from the cases of very high analgesia quoted above, that, in the present state of our knowledge at least, it

is impossible to employ spinal analgesia with safety in those cases requiring the Trendelenburg position. The angle of inclination which resulted in this high analgesia was very much smaller than that which would have been required to free the pelvis from the intestinal coils, and, had it been increased and persisted in, there is little doubt but that a catastrophe would have occurred. That our cases have so far been free from any disastrous result may be due rather to good luck than to good judgment. It must be remembered that the class of patient in our hands has been usually of the most suitable type; that very high analgesia has never been deliberately aimed at; and that neither adrenalin, nor any preparation of suprarenal gland, has been used in combination with the stovaine.

Two cases may be further referred to which are of interest from the point of view of after-effects. In these (Nos. 232 and 233), both cases of hernia, in which the analgesia affected the arms, well-marked paræsthesia was noticed for some days in both hands in the area supplied by the ulnar nerve. This is gradually clearing up.

In another case, that of a negro, in whom the analgesia was not high, glycosuria developed shortly after the operation; there is, however, no reason to suppose that it was the direct result of the analgesia. In no other case of the series has such a complication been noted where only stovaine was used.

Our conclusions, based upon this series of cases as well as upon the results of other observers, may be summarised as follows:—

(1) Spinal analgesia is a method which has a definite place and use in modern surgery, and of which the future is no longer in doubt.

(2) Stovaine is admirably suited to the purposes of spinal analgesia, and is probably as safe as any other analgesic at present in use.

(3) The risk of infecting the spinal meninges is, in proper hands and where proper precautions are taken, very slight.



(4) The method of spinal analgesia is unsuited to the Trendelenburg position.

(5) Failure to reach the spinal theca is usually due to faulty technique.

(6) Failure to obtain sufficiently high analgesia is commonly due to insufficient dosage, and is to be met in most cases by a second injection.

(7) The attempt to push the analgesia to a higher level than the fourth dorsal area is, in the present state of our knowledge, unwise.

(8) The lateral position, although rendering the injection rather more difficult than the sitting position, is less likely to be followed by disquieting symptoms, and commonly gives better results.

(9) The great majority of patients are in favour of the method, preferring to retain consciousness so long as the area of operation is screened from their view. In support of this many patients have elected to have spinal analgesia for second operations; of the whole of this series and of that of the 50 cases first published, only two have preferred general anæstheia when a second operation was necessary; the first on account of backache, and the second on account of headache.

(10) The contra-indications hitherto summarised by various Continental writers must be accepted with reserve, owing to the lack of details supplied, and the great variety of methods, analgesics, and doses employed. Sepsis, syphilis, and old age do not appear to us to influence the reaction of the patient to stovaine.

(11) The action of stovaine is purely one of surface effect, resulting in the blocking of nervous impulses, and probably affecting only the anterior and posterior nerve roots.

(12) The method being but a special branch of the science of anæsthetics, its administration and investigation should be undertaken by the anæsthetist rather than the surgeon, and especially so since at times its application may fail from various causes and necessitate the administration of a general anæsthetic.

## DETAILS OF CASES.

| No. | Operation.                               | Age. | Dose. | Position.  | Analg.    | Phenomena during Operation.               | Remarks. | Post-operation Phenomena.     |
|-----|--|------|-------|------------|-----------|---|----------|-------------------------------|
| 1   | Hydrocele -                              | 27   | gr.   | Sitting    | 10 D.     | Felt stitches in scrotum                  | -        | None.                         |
| 2   | Double ing. hernia<br>(and injection) -  | 42   | 6     | "          | 8 D.      | Felt pulling on omentum.                  | -        | -                             |
| 3   | Ing. hernia -                            | 14   | 5     | Lateral    | 6 D.      | Analgesia complete                        | -        | Vomiting headache,<br>2 days. |
| 4   | D. ing. hernia -                         | 37   | 4     | Sitting    | 5 D.      | Condition good                            | -        | None.                         |
| 5   | Exc. of ing. glands<br>(and injection) - | 24   | 8     | "          | Clavicles | Could not cough. Condition otherwise good | -        | "                             |
| 6   | Ing. hernia -                            | 40   | 5     | "          | None      | Analgesia satisfactory                    | -        | None.                         |
| 7   | Varicocele -                             | 23   | 6     | "          | 4 D.      | Some pain on pulling mesentery            | -        | "                             |
| 8   | Hemorrhoids -                            | 28   | 7     | "          | 5 D.      | None.                                     | -        | -                             |
| 9   | D. ing. hernia -                         | 35   | 7     | "          | 8 D.      | "   | -        | Headache 3 days.              |
| 10  | Ing. hernia -                            | 29   | 7     | "          | 6 D.      | "   | -        | -                             |
| 11  | Ext. urethrectomy -                      | 28   | 7     | "          | 2 D.      | "   | -        | Pyrexia 3 days.               |
| 12  | Dilatation of stricture -                | 28   | 7     | "          | 6 D.      | "   | -        | Headache.                     |
| 13  | Exc. of glands in groin -                | 73   | 7     | "          | 10 D.     | "   | -        | -                             |
| 14  | Ing. hernia -                            | 39   | 7     | L. lateral | 10 D.     | "   | -        | -                             |
| 15  | Exc. semilunar cartilage                 | 37   | 7     | "          | 11 D.     | "   | -        | Slight headache.              |
| 16  | Dilatation of stricture -                | 30   | 5     | Sitting    | 11 D.     | "   | -        | -                             |
| 17  | Varicose veins -                         | 24   | 6     | "          | 10 D.     | "   | -        | -                             |
|     |  |      |       |            | 4 D.      | "   | -        | -                             |

|    |  |   |    |    |            |       |   |   |   |                                 |
|----|--|---|----|----|------------|-------|---|---|---|---------------------------------|
| 18 | Ing. hernia                                  | - | 44 | 7  | L. lateral | 4 D.  | "   | " | " | Headache.                       |
| 19 | Erosion of pelvic sinuses                    | - | 47 | 6  | "          | 5 D.  | "   | " | " | "                               |
| 20 | D. ing. hernia                               | - | 55 | -- | -          | -     | Failure to enter spinal theca in any position.            | - | - | -                               |
| 21 | Same case, three weeks later; second hernia. | - | -  | 7  | Sitting    | 10 D. | No difficulty in entering theca on this occasion.         | - | - | None.                           |
| 22 | D. ing. hernia                               | - | 44 | 6  | L. lateral | 6 D.  | None  | - | - | "                               |
| 23 | F. body in knee                              | - | 29 | 7  | "          | 4 D.  | "   | - | - | "                               |
| 24 | Ing. hernia                                  | - | 29 | 7  | "          | 10 D. | "   | - | - | "                               |
| 25 | Ext. urethrotomy                             | - | 46 | 7  | "          | 8 D.  | "   | - | - | "                               |
| 26 | Expl. of testis                              | - | 17 | 4  | "          | 8 D.  | Some dragging pain in pit of stomach when cord pulled on. | - | - | "                               |
| 27 | Ing. hernia                                  | - | 42 | 7  | "          | 9 D.  | None  | - | - | Headache 3 days, pyrexia. None. |
| 28 | Ing. hernia                                  | - | 34 | 7  | "          | 9 D.  | "   | - | - | "                               |
| 29 | Ing. hernia                                  | - | 34 | 7  | "          | 9 D.  | "   | - | - | "                               |
| 30 | Fist. in ano                                 | - | 32 | 5  | "          | 6 D.  | "   | - | - | Headache.                       |
| 31 | Ing. hernia                                  | - | 26 | 7  | "          | 4 D.  | "   | - | - | "                               |
| 32 | Varicose veins                               | - | 19 | 4  | "          | 12 D. | Slight pain in certain areas                              | - | - | None.                           |
| 33 | Sacro-iliac dis.                             | - | 41 | 7  | "          | 6 D.  | None  | - | - | "                               |
| 34 | Same case, three weeks later.                | - | -- | 7  | "          | 10 D. | "   | - | - | "                               |
| 35 | Ing. hernia                                  | - | 23 | 7  | "          | 10 D. | "   | - | - | Headache.                       |
| 36 | Hæmorrhoids                                  | - | 49 | 5  | "          | 7 D.  | "   | - | - | None.                           |
| 37 | Ing. hernia strang. and injection            | - | 27 | 7  | "          | None  | Analgesia now complete                                    | - | - | None.                           |
| 38 | Ing. hernia                                  | - | 19 | 7  | "          | 5 D.  | None  | - | - | "                               |



| No. | Operation.                | Age. | Pose. | Position.   | Anaest. | Phenomena during Operation.  | Remarks. | Post-operation Phenomena. |
|-----|---------------------------|------|-------|-------------|---------|--|----------|---------------------------|
| 29  | D. ing. hernia -          | 19   | eg.   | L. lateral. | 10 D.   | Pain on pulling on conj. tendon                                      | -        | None.                     |
| 40  | Same case, second hernia. | -    | 6     | Sitting     | 4 D.    | None   | -        | "                         |
| 41  | Hallux valgus -           | 21   | 7     | "           | 1 D.    | Regurgitant vomiting -   | -        | Headache, slight.         |
| 42  | Varicose veins -          | 17   | 6     | "           | 4 D.    | None   | -        | None.                     |
| 43  | Fist. in ano -            | 35   | 5     | "           | 6 D.    | "  | -        | "                         |
| 44  | Ing. hernia -             | 28   | 4     | "           | Highs   | ---  | -        | ---                       |
|     | (2nd injection) -         | -    | 3     | L. lateral  | 6 mins  | ---  | -        | ---                       |
|     | (3rd injection)           | -    | 3     | "           | 1 D.    | Pallor, sweating, feeble pulse, analgesia complete. Could not cough. | -        | Bad headache 2 days.      |
| 45  | Ing. hernia -             | 30   | 7     | Sitting     | 9 D.    | None   | -        | None                      |
| 46  | Varicocoe -               | 24   | 7     | "           | 3 D.    | "  | -        | "                         |
| 47  | Necrosis of tibia -       | 60   | 7     | "           | 6 D.    | "  | -        | Headache                  |
| 48  | D. ing. hernia -          | 27   | 7     | "           | 3 D.    | Shortness of breath for five minutes.                                | -        | None.                     |
| 49  | Cystoscopy -              | 43   | 7     | "           | 3 D.    | None   | -        | "                         |
| 50  | Ing. hernia -             | 22   | 7     | "           | 10 D.   | "  | -        | "                         |
| 51  | Appendicectomy -          | 19   | 7     | "           | 8 D.    | Pain when abdominal wall and omentum pulled on.                      | -        | "                         |
| 52  | Ing. hernia -             | 29   | 7     | "           | 10 D.   | None   | -        | "                         |
| 53  | Ing. hernia -             | 32   | 7     | "           | 10 D.   | "  | -        | "                         |
| 54  | Cystotomy -               | 78   | 7     | "           | 12 D.   | "  | -        | "                         |

|    |                                  |    |   |   |       |  |   |                  |
|----|----------------------------------|----|---|---|-------|--|---|------------------|
| 55 | Prostatectomy (supra-pubic).     | 62 | 6 | " | 8 D.  | "  | " | "                |
| 56 | D. ing. hernia                   | 38 | 7 | " | 3 D.  | Nausea for a short time  | " | "                |
| 57 | Varicose veins                   | 37 | 5 | " | 5 D.  | Faintness, relieved by brandy and strychnine   | " | "                |
| 58 | Ing. hernia                      | 49 | 7 | " | 4 D.  | Some depression of pulse at beginning  | " | "                |
| 59 | Varicose veins                   | 18 | 5 | " | 9 D.  | None   | " | "                |
| 60 | Hæmorrhoids                      | 45 | 6 | " | 8 D.  | Ten minutes after injection, when analgesia had been stationary for five mins, pelvis was again raised, and analgesia rose one inch or more. | " | "                |
| 61 | Rectal examination               | 23 | 5 | " | 9 D.  | "  | " | "                |
| 62 | Comp. fract. of tibia            | 36 | 6 | " | 16 D. | None   | " | "                |
| 63 | Ventrosixation of uterus         | 39 | 7 | " | 6 D.  | Handling of uterus caused some pain towards end of operation, not relieved by morphia, so CHCl <sub>3</sub> given for remainder of time.     | " | "                |
| 64 | Varicose veins                   | 22 | 6 | " | 11 D. | None   | " | Slight headache. |
| 65 | Varicose veins                   | 42 | 6 | " | 8 D.  | "  | " | None.            |
| 66 | Varicose veins                   | 41 | 6 | " | 8 D.  | "  | " | "                |
| 67 | Ing. hernia                      | 50 | 7 | " | 16 D. | "  | " | "                |
| 68 | Ing. hernia                      | 43 | 6 | " | 10 D. | Pressing pain during latter half of operation  | " | "                |
| 69 | Ing. hernia                      | 25 | 7 | " | 11 D. | None   | " | "                |
| 70 | Necrosis of femur                | 21 | 7 | " | 10 D. | "  | " | "                |
| 71 | Hæmorrhoids                      | 48 | 5 | " | 4 D.  | "  | " | "                |
| 72 | Varicose veins (same pt. as 53). | 24 | 7 | " | 6 D.  | "  | " | "                |
| 73 | Ing. hernia                      | 28 | 6 | " | 7 D.  | Pain in tying off omentum referred to epigastrium.   | " | Headache.        |
| 74 | Suprapubic cystotomy             | 61 | 7 | " | 6 D.  | None   | " | None.            |

| No. | Operation.  | Age. | Dose.    | Position.   | Analg.      | Phenomena during Operation.   | Remarks. | Post-operation Phenomena.               |
|-----|---|------|----------|-------------|-------------|---|----------|---|
| 75  | Ing. hernia   | 19   | eg.<br>7 | Sitting.    | 3 D.        | None  | -        | Headache.                               |
| 76  | Varicocele  | 24   | 7        | "           | 10 D.       | "   | -        | "                                       |
| 77  | Ing. hernia   | 11   | 3        | "           | 2 D.        | "   | -        | "                                       |
| 78  | Varicose veins  | 23   | 6        | "           | 10 D.       | "   | -        | "                                       |
| 79  | Ing. hernia   | 15   | 4        | "           | 1 D.        | Vomiting and weak pulse for 10 minutes  | -        | Headache 24 hours.                      |
| 80  | Ing. hernia, strang.                                  | 63   | 7        | L. lateral. | 1 D.        | Slight general abdominal pain   | -        | None.                                   |
| 81  | Hydrocele   | 26   | 7        | Sitting.    | 10 D.       | None  | -        | Headache.                               |
| 82  | Varicose veins  | 29   | 7        | "           | 2 D.        | No analgesia on inner side of legs, so second injection given.                          | -        | —                                       |
| 83  | (and injection)                                       | —    | 2        | "           | None.       | Chloroform given  | -        | None.                                   |
| 84  | Hæmorrhoids   | 27   | 3        | "           | 10 D.       | None  | -        | "                                       |
| 85  | Ing. hernia   | 39   | 7        | "           | 10 D.       | "   | -        | "                                       |
| 85  | Ing. hernia   | 24   | 7        | "           | 6 D.        | Dull pain in upper part of wound when sac pulled out.                                   | -        | "                                       |
| 86  | D. ing. hernia  | 28   | 7        | "           | 4 D.        | None  | -        | "                                       |
| 87  | Appendectomy  | 29   | 7        | "           | 2 D.        | "   | -        | "                                       |
| 88  | Resect of bowel (intussusception).<br>(and injection) | 12   | 4        | L. lateral. | 10 knes.    | Second injection given, v. notes  | -        | Death on table, due to cardiac failure. |
| 89  | Ventral hernia  | 43   | 7        | "           | Mud. thigh. | Chloroform given.   | -        | —                                       |
| 89  | Ventral hernia  | 43   | 7        | "           | 3 D.        | Chloroform given during the last few minutes of operation owing to dragging sensations. | -        | None.                                   |
| 90  | Ing. hernia   | 42   | 6        | —           | —           | None  | -        | Headache.                               |



| 91  | Appendicectomy               | - | 23 | 7 | Sitting    | 6 D.  | Vertigo, nausea, and feeble pulse when pulling on bowel. Some pain referred to middle line at upper limit of analgesia. Slight pain in wound at end of operation.                | None.              |
|-----|------------------------------|---|----|---|------------|-------|--|--------------------|
| 92  | Varicocele                   | - | 26 | 5 | "          | 10 D. | None   | "                  |
| 93  | Sinus in perineum            | - | 49 | 5 | "          | 1 D.  | "  | "                  |
| 94  | Ing. hernia                  | - | 20 | 7 | "          | 6 D.  | "  | "                  |
| 95  | Varicose veins               | - | 36 | 7 | "          | 10 D. | "  | "                  |
| 96  | Ing. hernia                  | - | 27 | 7 | "          | 10 D. | "  | Slight headache.   |
| 97  | Exc. tuberculous testis      | - | 20 | 5 | "          | 10 D. | Some burning pain when canal was being explored.   | None.              |
| 98  | Ing. hernia                  | - | 51 | 7 | "          | 8 D.  | Pulling on omentum caused pain referred to lower end of sternum.   | "                  |
| 99  | Amput. through thigh         | - | 43 | 7 | R. lateral | 11 D. | Sharp pain and quickening of pulse on division of sciatic.   | "                  |
| 100 | Ing. hernia                  | - | 52 | 7 | Sitting    | 10 D. | Some pain over second left rib   | "                  |
| 101 | Ing. hernia                  | - | 24 | 7 | "          | 10 D. | None   | "                  |
| 102 | Exc. of semilunar cartilage. | - | 24 | 7 | "          | 10 D. | No analgesia over operation area, so CHCl <sub>3</sub> given.  | -                  |
| 103 | Exc. of testis               | - | 20 | 7 | "          | 10 D. | None   | None.              |
| 104 | Ing. hernia                  | - | 13 | 3 | L. lateral | 2 D.  | "  | "                  |
| 105 | Suprapubic cystotomy         | - | 62 | 7 | "          | 9 D.  | Slight syncopeal attacks 10 minutes after incision, apparently originated by washing out of bladder; these were much diminished by raising the legs and pressing on the abdomen. | Headache 24 hours. |
| 106 | Ext. urethrotomy             | - | 42 | 5 | "          | 11 D. | None   | None.              |
| 107 | Varicose veins               | - | 21 | - | -          | -     | No details except that analgesia satisfactory  | "                  |

| No. | Operation.                                      | Age. | Dose.       | Position.  | Analg. | Phenomena during Operation.  | Remarks.    | Post-operation Phenomena. |
|-----|---|------|-------------|------------|--------|--|-------------|---------------------------|
| 108 | Varicose veins<br>(2nd injection)               | 46   | ccg.<br>6.5 | L. lateral | None   | Second injection given   | -           | None                      |
| 109 | Dilat. of stricture                             | -    | 7           | "          | 1 D.   | None   | -           | "                         |
| 110 | Varicose veins                                  | 33   | 7           | "          | 7 D.   | "  | -           | "                         |
| 111 | Varicose veins                                  | 38   | 7           | "          | 8 D.   | "  | -           | "                         |
| 112 | Ing. hernia                                     | 43   | 7           | "          | 6 D.   | "  | -           | "                         |
| 113 | Ischiorectal abscess                            | 24   | 3           | "          | 1      | "  | -           | "                         |
| 114 | Ing. hernia                                     | 47   | 7           | "          | 4 D.   | "  | -           | "                         |
| 115 | Comp. fract. of femur                           | 36   | -           | "          | None   | Complete failure to enter tibia after several attempts.                  | -           | -                         |
| 116 | Hæmorrhoids                                     | 37   | 6           | Sitting    | 11 D.  | None   | -           | None.                     |
| 117 | Hæmorrhoids                                     | 59   | 7           | "          | 10 D.  | None   | -           | Headache.                 |
| 118 | Varicose veins                                  | 57   | 7           | "          | 10 D.  | "  | -           | None.                     |
| 119 | Ing. hernia                                     | 28   | 6           | L. lateral | 10 D.  | Pain on pulling on omentum referred to lower part of chest. Some nausea. | -           | Headache                  |
| 120 | Suprapubic cystotomy<br>(same case as No. 105). | 62   | 5           | Sitting    | 10 D.  | None on this occasion  | -           | None.                     |
| 121 | Varicocele                                      | 43   | 7           | L. lateral | 10 D.  | None   | -           | Headache.                 |
| 122 | Varicocele                                      | 35   | 5           | Sitting    | 10 D.  | "  | -           | None.                     |
| 123 | Suprapubic cystotomy                            | 50   | 6           | "          | 6 D.   | "  | -           | "                         |
| 124 | D. ing. hernia                                  | 41   | 6           | L. lateral | 6 D.   | Operation lasted one hour, during last five minutes.                     | Slight pain | "                         |
| 125 | Varicocele                                      | 28   | -           | -          | -      | No details except that analgesia satisfactory.                           | -           | "                         |
| 125 | Int. urethrotomy                                | 32   | 5           | L. lateral | 10 D.  | None   | -           | "                         |

|     |  |   |    |   |            |       |   |   |           |
|-----|--|---|----|---|------------|-------|---|---|-----------|
| 126 | Ing. hernia<br>(2nd injection)         | - | 16 | 5 | Sitting    | None  | Second injection given  | - | "         |
| 127 | Femoral hernia                         | - | -  | 5 | R. lateral | 3 D.  | Nausea and vomiting   | - | "         |
| 128 | Ext. urethrotomy                       | - | 50 | 7 | Sitting    | 9 D.  | None  | - | "         |
| 129 | Fract. tibia                           | - | 53 | - | -          | -     | No details except that analgesia satisfactory   | - | "         |
| 130 | D. ing. hernia                         | - | 44 | 6 | L. lateral | 2 D.  | " " "   | - | Headache. |
| 131 | Varicocele                             | - | 27 | - | -          | -     | Injection not given as flow of c.s. fluid was very poor.  | - | -         |
| 132 | Ing. hernia                            | - | 19 | 5 | -          | 3 D.  | Slight vomiting   | - | None      |
| 133 | Colostomy                              | - | 28 | - | -          | -     | Several attempts to inject were made in both positions, but a satisfactory flow could not be obtained       | - | -         |
| 134 | Ing. hernia                            | - | 20 | 5 | L. lateral | 6 D.  | Vomiting when ementum pulled on   | - | None.     |
| 135 | D. ing. hernia                         | - | 38 | 6 | -          | 3 D.  | Operation lasted 80 minutes, some pain during last 15 minutes on deep manipulation                          | - | "         |
| 136 | Hydrocele                              | - | 26 | 5 | -          | 6 D.  | None  | - | "         |
| 137 | Exc. of testis (same case as No. 103). | - | 47 | 5 | -          | 6 D.  | "   | - | None.     |
| 138 | Ing. hernia.                           | - | 29 | 5 | R. "       | 6 D.  | "   | - | "         |
| 139 | Amp. through thigh for gangrene.       | - | 29 | 5 | L. "       | 4 D.  | "   | - | "         |
| 140 | Varicocele                             | - | 70 | 5 | Sitting    | 10 D. | "   | - | No shock. |
| 141 | Ventroluxation of uterus               | - | 18 | 5 | -          | 10 D. | Some dull pain  | - | None.     |
| 142 | Prostatectomy                          | - | 62 | 6 | L. lateral | 4 D.  | Operation lasted 70 minutes, being done by filigree; during last 10 minutes some pain in chest and abdomen. | - | "         |
| 143 | Cystoscopy                             | - | 64 | - | -          | -     | Poor flow of c.s. fluid, so injection not made.   | - | -         |
| 143 | Cystoscopy                             | - | 45 | 5 | L. lateral | 4 D.  | None  | - | None.     |



| No. | Operation.   | Age. | Dose.    | Position.             | Analg.        | Phenomena during Operation.                     | Remarks. | Post-operation Phenomena.                     |
|-----|--|------|----------|-----------------------|---------------|---|----------|---|
| 144 | Ing. hernia -<br>(and injection 45 minutes later.) | 27   | cg.<br>6 | Sitting<br>L. lateral | 10 D.<br>3 D. | Some pain in wound<br>Still slight pain         | -<br>-   | None.<br>Headache and vomit-<br>ing 24 hours. |
| 145 | Varicocele -                                       | 25   | 5        | "                     | 6 D.          | None  | -        | None.   |
| 146 | Fracture of tibia (same case as No. 129).          | 41   | 5        | "                     | 5 D.          | "   | -        | "   |
| 147 | Ischio-rectal abscess                              | 43   | 5        | "                     | 3 D.          | "   | -        | "   |
| 148 | Varicose veins -                                   | 40   | 5        | "                     | 10 D.         | "   | -        | "   |
| 149 | D. ing. hernia -                                   | 22   | 5        | Sitting<br>L. lateral | 6 D.          | "   | -        | "   |
| 150 | D. ing. hernia -                                   | 30   | 5        | "                     | 6 D.          | Pain on pulling omentum and when closing wound. | -        | "   |
| 151 | D. ing. hernia -                                   | 48   | 5        | "                     | 6 D.          | None  | -        | "   |
| 152 | Double hydrocele                                   | 15   | 5        | "                     | 2 D.          | "   | -        | "   |
| 153 | Varicose veins -                                   | 45   | 5        | "                     | 9 D.          | "   | -        | "   |
| 154 | Urethral fistula -                                 | 26   | 5        | "                     | 6 D.          | "   | -        | "   |
| 155 | Expl. of knee joint                                | 36   | 5        | "                     | 11 D.         | Analgesia on left leg alone                     | -        | "   |
| 156 | Ing. hernia -<br>(and injection)                   | 23   | 5        | "                     | None          | Second injection given                          | -        | "   |
| 157 | Ampt. through thigh                                | -    | 4        | "                     | 2 D.          | None  | -        | "   |
| 158 | Urethral fistula -                                 | 50   | 6        | R.                    | 2 D.          | "   | -        | "   |
| 159 | Ing. hernia -                                      | 32   | 5        | L.                    | 6 D.          | "   | -        | "   |
| 160 | Exc. of testis                                     | 18   | 5        | "                     | 6 D.          | "   | -        | "   |
|     |  | 20   | 6        | "                     | 6 D.          | Pain at second dorsal when vas pulled on        | -        | "   |

|     |                              |   |    |   |            |       |   |   |   |             |
|-----|------------------------------|---|----|---|------------|-------|---|---|---|-------------|
| 161 | Str. femoral hernia          | - | 67 | 5 | "          | 11 D. | Pain on pulling omentum   | - | - | "           |
| 162 | Fist. in ano                 | - | 22 | 5 | "          | 10 D. | None  | - | - | "           |
| 163 | D. ing. hernia               | - | 37 | 5 | Sitting    | 1 D.  | "   | - | - | "           |
| 164 | Ing. hernia                  | - | 30 | 5 | L. lateral | 6 D.  | "   | - | - | Headache.   |
| 165 | Varicose veins               | - | 30 | 5 | R.         | 6 D.  | "   | - | - | None.       |
| 166 | Ing. hernia                  | - | 40 | 7 | Sitting    | 4 D.  | Pain referred to upper limit of analgesia when omentum ligatured.                       | - | - | "           |
| 167 | Ing. hernia                  | - | 57 | 5 | L. lateral | 6 D.  | None  | - | - | Bronchitis. |
| 168 | Ing. hernia                  | - | 33 | 6 | "          | 8 D.  | "   | - | - | None.       |
| 169 | Ing. hernia                  | - | 44 | 6 | "          | 9 D.  | Felt pain on handling peritoneum an hour after injection.                               | - | - | "           |
| 170 | Appendicectomy               | - | 23 | 5 | R.         | 10 D. | Pain in chest when mesentery pulled on  | - | - | "           |
| 171 | Appendicectomy               | - | 19 | 6 | "          | 3 D.  | Analgesia very perfect  | - | - | "           |
| 172 | Ing. hernia                  | - | 54 | 6 | L.         | 6 D.  | None  | - | - | "           |
| 173 | Exc. of testis               | - | 33 | 5 | "          | 2 D.  | Slight nausea   | - | - | "           |
| 174 | Hydrocele                    | - | 40 | 5 | "          | 11 D. | Pain over heart; flabby pulse   | - | - | "           |
| 175 | Exc. of semilunar cartilage. | - | 24 | 5 | R.         | 12 D. | None  | - | - | "           |
| 176 | D. ing. hernia               | - | 44 | 6 | L.         | 6 D.  | At end of 4 of an hour analgesia passed off, so $\text{CHCl}_3$ given to complete.      | - | - | "           |
| 177 | Ing. hernia (2nd injection)  | - | 59 | 7 | R.         | 12 D. | Pain, so second injection given   | - | - | "           |
| 178 | Varicocoele                  | - | 23 | 5 | L.         | 4 D.  | Some faintness  | - | - | "           |
| 179 | Dilat. of stricture          | - | 29 | 5 | "          | 10 D. | None  | - | - | "           |
| 180 | Ventroluxation of uterus     | - | 34 | 6 | "          | 6 D.  | Pain on pulling uterus, and later in wound; operation completed under $\text{CHCl}_3$ . | - | - | "           |

| No. | Operation.                   | Age. | Dose. | Position.  | Analg. | Phenomena during Operation.  | Remarks. | Post-operation Phenomena. |
|-----|------------------------------|------|-------|------------|--------|--|----------|---------------------------|
| 181 | Skin-grafting                | 40   | eg.   | L. lateral | 3 D.   | None   | -        | None.                     |
| 182 | Suprapubic cystotomy         | 31   | 5     | "          | 3 D.   | "  | -        | "                         |
| 183 | Dilatation of stricture      | 30   | 5     | "          | 3 D.   | "  | -        | "                         |
| 184 | Breaking down adhesions      | 51   | 5     | "          | 6 D.   | "  | -        | "                         |
| 185 | Varicose veins               | 43   | 6     | "          | 3 D.   | "  | -        | "                         |
| 186 | Ing. hernia                  | 19   | 5     | R.         | 11 D.  | Analgesia multiblocum; second injection.                                       | -        | None.                     |
| 187 | (2nd injection)              | 4    | 4     | "          | 4 D.   | None   | -        | "                         |
| 187 | Ing. hernia                  | 14   | 5     | L.         | 7 D.   | Very slow use of analgesia   | -        | "                         |
| 188 | Ing. hernia                  | 15   | 4     | R.         | 4 D.   | None   | -        | "                         |
| 189 | D. ing. hernia               | 29   | 6     | L.         | 1 D.   | Vomiting 15 minutes after injection; pain on pulling omentum of second hernia. | -        | "                         |
| 190 | Screwing tibia               | 18   | 6     | "          | 4 D.   | None   | -        | "                         |
| 191 | Screwing tibia               | 18   | 6     | R.         | 10 D.  | Felt suturing 75 minutes after injection                                       | -        | "                         |
| 192 | Fist. in ano                 | 15   | 6     | Sitting    | 10 D.  | None   | -        | "                         |
| 193 | Varicocele                   | 15   | 5     | L. lateral | -      | Very free flow of fluid, but no analgesia; second injection.                   | -        | "                         |
| 194 | (2nd injection)              | 5    | 5     | "          | 8 D.   | None   | -        | "                         |
| 194 | Necrosis of tibia            | 34   | 5     | R.         | 10 D.  | "  | -        | "                         |
| 195 | Exc. of semilunar cartilage. | 28   | 6     | L.         | 8 D.   | "  | -        | "                         |
| 196 | D. ing. hernia               | 19   | 6     | R.         | 4 D.   | "  | -        | "                         |



|     | Colostomy                      |   | 49 | 6 | L.         | 4 D.  | Stood operation well, and hardly felt exploration of abdomen as high as liver; felt stitches 75 minutes after injection. Died 4 hours later, but as patient very feeble and extremely ill, death was probably not due to stovaine. |
|-----|--------------------------------|---|----|---|------------|-------|--|
| 197 |                                |   |    |   |            |       |  |
| 198 | Ing. hernia                    | - | 26 | 5 | "          | 10 D. | None   |
| 199 | Expl. of testis                | - | 22 | 6 | "          | 2 D.  | "  |
| 200 | Appendicectomy                 | - | 18 | 6 | R.         | 2 D.  | Analgesia down arms on inner side as far as wrists; a little retching.   |
| 201 | Varicose veins                 | - | 25 | 6 | L.         | 8 D.  | Slight pain in right thigh 80 minutes after injection.   |
| 202 | Ventral hernia                 | - | 25 | 6 | R.         | 8 D.  | Some pain in chest when abdominal organs handled.  |
| 203 | Ing. hernia                    | - | 42 | 6 | L.         | 6 D.  | None   |
| 204 | Varicose veins                 | - | 37 | 6 | "          | 9 D.  | "  |
| 205 | Ing. hernia<br>(2nd injection) | - | 46 | 6 | R.         | 12 D. | Feeble flow of c. s. fluid; second injection.  |
| 206 | Ext. urethrotomy               | - | 36 | 4 | "          | 8 D.  | None   |
| 207 | Skin-grafting                  | - | 54 | 6 | L.         | 6 D.  | "  |
| 208 | Ing. hernia                    | - | 49 | 6 | Sitting    | 9 D.  | "  |
| 209 | Ing. hernia                    | - | 19 | 6 | "          | 11 D. | Some pain in upper angle of wound.   |
| 210 | Varicose veins                 | - | 43 | 6 | L. lateral | 2 D.  | None   |
| 211 | Ing. hernia                    | - | 39 | 6 | R.         | 2 D.  | "  |
| 212 | Hydrocele                      | - | 23 | 5 | L.         | 4 D.  | "  |
| 213 | Ing. hernia                    | - | 42 | 6 | "          | 2 D.  | "  |
| 214 | Ing. hernia                    | - | 33 | 6 | "          | 2 D.  | Slight vomiting  |
|     |                                |   |    |   |            | 6 D.  | None   |
|     |                                |   |    |   |            |       | Headache   |
|     |                                |   |    |   |            |       | None.  |

| No. | Operation.                | Age. | Dose.    | Position.  | Analg. | Phenomena during Operation.  | Remarks. | Post-operation Phenomena. |
|-----|---------------------------|------|----------|------------|--------|--|----------|---------------------------|
| 215 | Ing. hernia               | 37   | cg.<br>5 | L. lateral | 4 D.   | None   | -        | None.                     |
| 216 | Ing. hernia               | 60   | 6        | R. "       | 2 D.   | "  | -        | "                         |
| 217 | Varicose veins            | 21   | 5        | L. "       | 4 D.   | "  | -        | "                         |
| 218 | Partial resect. of tarsus | 34   | 7        | "          | -      | Injection made after three attempts, no c.s. fluid being obtained: pain complained of down left leg on third puncture; no analgesia resulted. $\text{CHCl}_3$ given. |          |                           |
| 219 | Wiring of patella         | 64   | -        | -          | -      | No fluid obtained after several attempts, probably owing to difficult position of patient, who was wearing a back splint. $\text{CHCl}_3$ given.                     |          |                           |
| 220 | Ing. hernia               | 27   | 6        | L. lateral | 8 D.   | None   | -        | None.                     |
| 221 | Enterostomy               | 32   | 6        | R. "       | 6 D.   | Patient was very ill with intestinal paresis, fecal vomiting, and pulse of 120.  |          |                           |
| 222 | Ing. hernia               | 30   | 6        | L. lateral | 6 D.   | None   | -        | "                         |
| 223 | Varicose veins            | 46   | 6        | "          | 8 D.   | "  | -        | "                         |
| 224 | Ing. hernia (female case) | 32   | 6        | "          | 8 D.   | "  | -        | "                         |
| 225 | Hysterectomy              | 48   | 7        | Sitting    | 4 D.   | Uterus and fibroid weighed 8 lbs., analgesia complete. Operation lasted one hour and twenty minutes.   |          |                           |

|     | Varicose veins                           | - | - | 32 | 6 | R. lateral | 10 D. | Sensitive area in centre of inner aspect of calf.  | Catheter once owing to slight atony of bladder.                             |
|-----|--|---|---|----|---|------------|-------|--|---|
| 226 |  |   |   |    |   |            |       |  |   |
| 227 | (Same case a week later for other side.) | - | - | -  | 6 | L. "       | 10 D. | None   | None.   |
| 228 | Exc. of lipoma in foot                   | - | - | 43 | 5 | Sitting    | 12 D. | "  | "   |
| 229 | Umbilical hernia                         | - | - | 34 | 6 | "          | 1 D.  | Analgesia to clavicles: 2 minutes, patient weighed 18 stone. Some respiratory difficulty but no cyanosis. O. given for 10 minutes, large filigree implanted. | "   |
| 230 | Ing. hernia                              | - | - | 50 | 6 | L. lateral | 6 D.  | None   | "   |
| 231 | Ing. hernia                              | - | - | 37 | 6 | "          | 8 D.  | "  | "   |
| 232 | D. ing. hernia                           | - | - | 32 | 6 | "          | 1 D.  | "  | Well-marked ulnar paresthesia of both hands for some weeks after operation. |
| 233 | Ing. hernia                              | - | - | 36 | 6 | "          | 2 D.  | "  | None.   |
| 234 | Varicocele                               | - | - | 43 | 5 | "          | 10 D. | "  | "   |
| 235 | Plastic op. on urethra                   | - | - | 33 | 5 | "          | 12 D. | "  | "   |
| 236 | Ventroluxation of uterus                 | - | - | 50 | 6 | "          | 8 D.  | Felt dragging sensation when uterus pulled on, and became faint in middle of operation. CHCl <sub>3</sub> given.   | "   |
| 237 | Appendicectomy                           | - | - | 34 | 6 | R. "       | 7 D.  | Slight pain in chest on pulling on appendix  | "   |



| No. | Operation.                | Age. | Dose.    | Position.  | Analg. | Phenomena during Operation.   | Remarks. | Post-operation Phenomena.       |
|-----|---------------------------|------|----------|------------|--------|---|----------|---------------------------------|
| 238 | Ing. hernia               | 23   | cg.<br>6 | L. lateral | 6 D.   | None  | -        | None.                           |
| 239 | Suprapubic prostatectomy. | 64   | 6        | "          | 8 D.   | Patient very feeble before operation, having suffered from retention of urine for years.  | -        | None. Died third day of uræmia. |
| 240 | Hæmorrhoids               | 28   | 6        | "          | 8 D.   | None  | -        | None.                           |
| 241 | Ing. hernia               | 18   | 6        | R.         | 5 D.   | "   | -        | "                               |
| 242 | Appendicular abscess      | 21   | 6        | "          | 6 D.   | Some sickness when handling bowels  | -        | "                               |
| 243 | Ing. hernia               | 26   | 6        | "          | 5 D.   | None  | -        | "                               |
| 244 | Varicocele                | 27   | 6        | L.         | 2 D.   | "   | -        | "                               |
| 245 | Ing. hernia               | 33   | 6        | "          | 2 D.   | "   | -        | "                               |
| 246 | Amp. through thigh        | 43   | 6        | R.         | 3 D.   | Syncopeal attack when femoral artery being freed for ligature, combated by pressure on abdomen and raising other leg.                     | -        | "                               |
| 247 | Umb. and ing. hernia      | 41   | 6        | L.         | 4 D.   | Slight pain during operation on umb. hernia, and 100 minutes after injection $\text{CHCl}_3$ given to complete operation for ing. hernia. | -        | "                               |
| 248 | Varicocele                | 18   | 5        | "          | 2 D.   | None  | -        | "                               |
| 249 | Varicose veins            | 51   | 5        | "          | 6 D.   | "   | -        | "                               |
| 250 | Ing. hernia               | 25   | 5        | R.         | 2 D.   | "   | -        | "                               |

## ANALYSIS OF CASES REFERRED TO.

|   |    |
|---|----|
| Adhesions - - - - -                     | 1  |
| Amputation (thigh) - - - - -            | 4  |
| Appendicectomy - - - - -                | 7  |
| Arthrotomy (knee-joint) - - - - -       | 2  |
| Bunion - - - - -                        | 1  |
| Colostomy - - - - -                     | 2  |
| Compound fracture (femur) - - - - -     | 1  |
| Cystoscopy - - - - -                    | 2  |
| Cystotomy (suprapubic) - - - - -        | 6  |
| Dilatation of stricture - - - - -       | 5  |
| Enterectomy - - - - -                   | 1  |
| Enterostomy - - - - -                   | 1  |
| Excision of lipoma - - - - -            | 1  |
| "    " semilunar cartilage - - - - -    | 4  |
| "    " testis - - - - -                 | 5  |
| Exploration of testis - - - - -         | 2  |
| Fistula in ano - - - - -                | 4  |
| Glands (extirpation) - - - - -          | 2  |
| Hæmorrhoids (ligature) - - - - -        | 8  |
| Hernia (femoral) - - - - -              | 2  |
| "    (inguinal) - - - - -               | 99 |
| "    (ventral) - - - - -                | 4  |
| Hydrocele - - - - -                     | 6  |
| Hysterectomy - - - - -                  | 1  |
| Ischiorectal abscess - - - - -          | 2  |
| Necrosis of femur - - - - -             | 1  |
| "    " tibia - - - - -                  | 2  |
| Plastic on urethra - - - - -            | 3  |
| Prostatectomy (suprapubic) - - - - -    | 3  |
| Rectal examination - - - - -            | 1  |
| Resection (partial) of tarsus - - - - - | 1  |
| Sacroiliac disease - - - - -            | 2  |
| Screwing tibia - - - - -                | 5  |
| Sinus (inguinal) - - - - -              | 1  |
| "    (pelvic) - - - - -                 | 1  |
| "    (perineal) - - - - -               | 1  |
| Skin-grafting - - - - -                 | 2  |

|                            |   |   |   |            |
|----------------------------|---|---|---|------------|
| Urethrotomy (ext.) -       | - | - | - | 5          |
| „ (int.) -                 | - | - | - | 1          |
| Varicocele -               | - | - | - | 14         |
| Varicose veins -           | - | - | - | 22         |
| Ventrofixation of uterus - | - | - | - | 4          |
| Wiring patella -           | - | - | - | 1          |
| Total cases                |   |   |   | <u>250</u> |

## Failures :—

(a) To enter spinal theca - 6 = 2·4 per cent.

After second injection - 1 = .4 „

(c) Partial, requiring general anæ-

thetic to complete operation 8 = 3·2 „

Second injections given - - 8 = 3·2 „

Largest individual dose - - 8 cg.

Largest total dose - - 13·5 cg.

Smallest dose - - 3 cg.

Oldest patients - - 70, 73, and 78 years.

Youngest - - 11, 12, „ 18 „

Longest period of analgesia (dose

8 cg.) - - 2 hours +.

Highest analgesia - - To clavicles.

N.B.—Here dose varied from 4 cg. and 5 cg. in boys of 11 to 14, to 7 cg. and 8 cg. in adults.





REMARKS ON THE TREATMENT OF FRACTURES  
OF LONG BONES WITH SPECIAL REFERENCE  
TO THE EXTENSION METHOD.

By J. HOGARTH PRINGLE, M.B., F.R.C.S.,  
*Surgeon, Royal Infirmary, Glasgow.*

[With Plate V.]

DURING the last year or two a considerable number of papers have been published relating to the treatment of fractures, some dealing with the subject generally, and others with the treatment of individual types of fractures. But the opinions expressed as to how fractures should be managed are still of the most diverse character.

Some will have splints and immobilise their cases of fracture. Others regard immobilisation as an abomination, and advocate massage with early movement of the limb. Others again wire, nail, or screw the fragments together sometimes through incisions, sometimes without any; while others treat fractures by extension apparatus.

I take it that the object of treatment is to obtain a functionally useful limb in the shortest time possible. Most patients wish to be up and about as soon as possible, and time in the treatment is a matter of great importance.

Much has been made of the question of the perfect alignment of the fragments, and some surgeons would like all others to believe that no treatment is worthy of the name which fails to restore a fractured bone to its natural and normal anatomical shape, and that this can only be done by the use of screws, nails, etc., either through an incision or simply from the surface under the control of the X-rays; so that, while the fragments are brought into position and held there, the fixing nails are driven through the soft parts into the fragments and maintained in position by means of external clamps. In my opinion this is a decidedly bad method of procedure, for the fixing agents will always tend to work loose in the bone and lose their hold, and in consequence will permit some slipping of the fragments to occur.

I quite admit that to obtain the normal alignment after

fracture ought to be gratifying to a surgeon, but I am convinced that it is not necessary for the purpose of establishing restitution of the normal function, except in the case of fractures into, or near, joints. If, along with a restoration of function after a fracture, we get a return to the natural shape of the bone, well and good, but the function ought to be the primary object, and is constantly obtained without the former. It has often occurred, and will frequently occur in the future, that, for example, in treating a spiral fracture of the leg bones by splints, a good strong limb has ultimately resulted, and in which, by inspection and palpation, the bones appear to be in perfect position, but when examined by the X-rays the most unexpected deformity will at times be discovered.

The argument of those, so loud in their advocacy of wiring fractures, that this method alone gives perfect results, is a fallacious one. At the operation one can often obtain absolutely perfect reposition of fragments, and if not always absolute, it is very nearly so, and is almost invariably better than can be obtained by the use of splints, but, if, some time after the fixation has been made, the bone is rayed, it will again sometimes, not always, happen that the plate shows considerable deformity of the bone. The screws, nails, or wires, etc., have not held the fragments permanently together, but, owing to the tension of muscles, movements on the part of the patient, etc., the fixing agents have become loosened, and the fragments have fallen away more or less from one another again, though union may be absolutely strong. This result will probably still more often occur where the fragments have only been fixed under control of the X-rays.

I have wired fractures, both simple and compound, very frequently, and, on the whole, have been greatly pleased with the results that have been obtained, but to wire every fracture is, I feel certain, altogether unnecessary. I believe that most compound fractures should be wired, as well as all simple fractures of the diaphysis of long bones, where one is satisfied that the deformity is not to be corrected by other means, and all those cases where soft tissues intervene between fragments and in which they cannot be got rid of by manipulation. Most fractures at the elbow and shoulder joints, and

some, which occur at the ankle, knee, and hip joints, require wiring. Formerly I used to consider that shortening of a limb was a reason for wiring a fracture, but I now believe that it is not really necessary, for reasons to be mentioned in speaking of the extension method of treatment.

Immobilisation by means of splints is the most uncertain method of treatment, both as regards the obtaining of union of the bone and the restoration of the normal shape of the bone, and it is probably the slowest as regards the restoration of function, for during the time the splints are in use (as ordinarily adopted) muscles, tendons, ligaments, etc., have every opportunity afforded them of shortening and becoming rigid, with the result that, as every one knows, when the fracture is united and the splints are given up, the patient is as long, if not longer, in recovering the use of the limb, as he was in bed with his splints on. I shall not be far wrong in saying that the majority of patients, with a Pott's fracture, as treated with splints, are 16 weeks or so before they are able to resume work.

*Massage and Movements.*—We have heard a great deal during the last year or two regarding this method of treatment, usually associated with the name of Lucas-Championnière. In this method splints are simply used to prevent fragments from falling away to too great an extent, after they have been brought into position by manipulation. By means of massage from the first, it is claimed that effused blood is got rid of as quickly as possible, the nutrition of the limb, muscles, skin, etc., is maintained, and, by early movement, tendons, muscles, and the synovial membranes of tendon sheaths, as well as of joints, are exercised, and in consequence adhesions are either prevented from forming or are stretched if they occur. It is, moreover, claimed that there is a great saving of time to the patient as the result, for almost as soon as the bone is united the individual is ready to use it, which is certainly never the case with those patients who have been treated by splints.

I believe that this claim is well justified, for I have frequently employed the method in certain fractures, and with excellent results in every case in which it has been tried; but I believe that every fracture is not suited for it. It is, in my opinion, specially useful in fractures in the neighbourhood of joints,



where one is not induced to fix the fragments by open incision. Lucas-Championnière and many of his followers consider that all fractures of the bones of the limbs, except those of the patella, ought to be treated in this manner.

Regarding the treatment of long bones by this method, there are two points concerning which the advocates of the method never vouchsafe information. It would, in the first place, be of interest to know what average amount of shortening is to be expected after, say, a fracture of the shaft of the femur, or of the humerus, or of both bones of the leg; and, just to satisfy curiosity, it would be interesting to see X-ray pictures of their results, for although, as I have said, I do not consider perfect alignment necessary, still the nearer we come to it the better. Shortening, however, after fracture of the bones of the lower extremity is serious. Shortening of  $\frac{3}{4}$  inch makes an individual distinctly lame, and if longer than that may be very decidedly inconvenient. So inconvenient is it that I have, until recently, always considered great shortening that could not be overcome, a reason for fixing fractures through an incision. In the upper limb, shortening of one arm, for those engaged in certain occupations, *e.g.*, wrights or carpenters, is a decided drawback.

In the method of treating fractures by permanent extension, we have a means of treatment which seems to me to combine nearly, if not actually, all the advantages claimed for Lucas-Championnière's method. It gets rid of effusion, allows early movement, and permits the nutrition of the tissues to be maintained, but it does much more than massage alone can ever effect, for, by its use, shortening is overcome to a remarkable extent, and, in addition, it continually permits a very accurate restoration of the shape of the bone, even in cases in which great deformity is present—in fact, to a degree, which is seldom, if ever, obtained by the use of splints, and which almost equals that of the open method. In many cases, the open method of treatment cannot give better results as regards alignment of the fragments, and so far as the time occupied in the treatment is concerned, the extension method is much more rapid.

I have been employing this method now for a considerable time, and the more I use it the better I like it. The shortening of the time, during which the patient is under treatment,

has been remarkable ; patients, after fracture of the shaft of the femur, putting their full weight upon the injured limb after from seven to eight weeks in many cases, and with a free, if not an absolutely normal range of movement at the joints of the injured limbs, though in many cases this has been perfect.

During the last twelve months, I have treated 12 cases of fracture of the shaft of the femur, in which, though the average shortening at the time of admission was 2 c.m., it was, at the time of dismissal, only 0·5 c.m.—a result that is very much better than is obtained either by splinting or by massage. In 10 patients treated by splints, the average shortening on admission was 2 c.m., and at the time of dismissal was 1·8 c.m. None of the patients treated by extension have shown any signs of œdema, or other troubles arising from thrombosed veins so constantly seen after splint treatment.

The extension of fractured limbs is a very old method of treatment, but it has been advocated more recently by Bardenheuer, Helferich, and Hennequin, among others, and it is particularly the first, who has elaborated the method, and adopted simple means for effecting the extension to counteract the various varieties of deformity that may be encountered. Hennequin's methods are so cumbrous that I fancy few will adopt them. I have gone into them fully, but they appear to me to have no advantage at all over Bardenheuer's, but rather to have several disadvantages. Bardenheuer and his pupils have published numerous skiagrams to show how effectually they can get rid of extreme lateral deformity by these methods. So far my results do not compare with theirs in this respect, though they are improving as the methods are becoming more completely understood, but the shortening is frequently overcome to a great extent, and that is a matter of the first importance. I had much trouble at first in carrying out this line of treatment, as our British beds are not adapted to the original forms of apparatus, but I have clamps now, which can be adjusted to beds with tubular foot and side rods, and which do all that is required.

Bardenheuer's extension differs from the old method first of all in this respect, that the longitudinal extending straps run the whole length of the limb. In the old method, as

I learnt it, and always saw it practised in cases of fracture of the femur, to which it was practically confined, the straps ran to just below the site of the fracture, but, in every case of fracture of the lower limb, in fractures of the leg as well as of the thigh, the straps in the modernised method reach from the perinaeal groove on the inner side of the limb to a similar level on the outer aspect, leaving a loop below the foot to which the extending cord is applied. In this way, a pull is obtained on skin fasciæ and muscles throughout the whole length of the limb.

Good adhesive and non-irritating plaster, spread on strong canvas, is required for this, and it is fixed to the limb, which must be shaved, by circular strips of adhesive plaster on cambric, applied in an imbricating manner one above the other; beginning below just above the ankle, they extend as far as the level of the tibial tubercle. The knee joint is left uncovered by these circular strips in order to permit movements to be carried out, but they are commenced again one inch above the level of the upper border of the patella, and continue up the thigh as far as possible.

It is well to protect the skin over the malleoli, and over the shin border of the tibia, from the pressure of these straps by folds of gauze. A small square of 6-10 ply of gauze is placed over each malleolus under the longitudinal straps (Fig. 1), and a long strip about 1 inch wide of 4-6 ply of gauze over the anterior tibial border under the circular strips (*see* Fig. 1). Pressure sores will not form if care is given to see that the first (lowest) circular strip is not too close to the ankle joint, so that it will not be dragged down, and on to the instep, and if the succeeding strips are made to accurately imbricate, so that no area of skin is left exposed between any two of them. A pad (*see* Fig. 1) is placed beneath the knee to maintain a very slight degree of flexion, and a weight, that may be anything up to 35 lbs., is applied to the longitudinal straps.

When shortening of the limb is got rid of, or is at least reduced, any lateral displacement of the fragments, which may exist, is to be counteracted by secondary transverse pulls; these are applied by taking a piece of broad adhesive plaster spread on canvas, and encircling the limb with it,



# PLATE V.

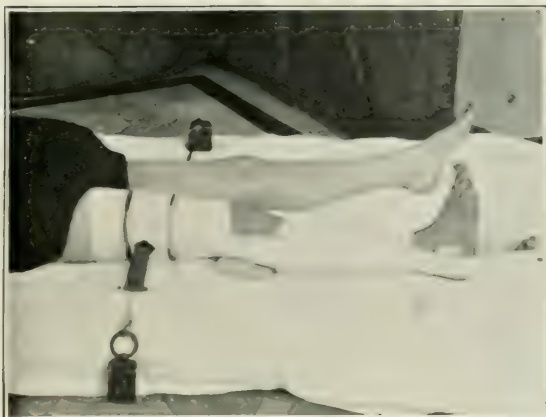


Fig. 1.—*Fracture of middle of shaft of femur in extension. Note the gauze pads at malleolus and along crest of tibia under the extension straps. The double-acting transverse pulls at site of fracture. The pad under the knee.*

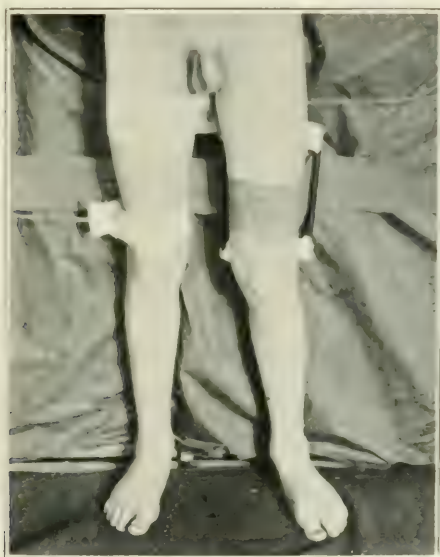


Fig. 2.—*To illustrate action of two transverse pulls on right femur acting so as to drag the upper end of lower fragment inwards. On left femur a backward-acting pull.*



leaving one end longer than the other. The short end is sewn to the other opposite the centre of the lateral aspect of the limb (on the inner or outer aspect, as the case may be), so as to make a loop which fits the limb quite closely but not tightly, while to the long free end of the plaster a weight is attached by a cord. A pull is thus applied to the lower end of the upper fragment, another to the upper end of the lower one, and carried across the bed to the side opposite to that to which the fragment is displaced, and the weight is just dropped over the edge of the mattress.

The transverse pulls are often arranged as in Fig. 1, where the end of a loop round the thigh is passed through a slit in a broader loop, the free end of which is pulled by its weight to the opposite side from that to which the weight attached to the former pulls, and, in consequence, the fractured ends tend to be approximated. In many cases one transverse pull, applied to each fragment, is not sufficient to correct its displacement; the effect may be increased by employing another pull acting at the other end of the same fragment, but in the opposite direction (*see* Fig. 2, where the upper pull, on the right thigh, directed towards the left side of the patient, is supposed to be acting on the upper end of the lower fragment tending to be displaced outwards, and its effect is increased by another pull, at the lower extremity of the same fragment, directed to the right-hand side of the patient). To these side pulls weights of from 2 to 6 lbs. are applied.

Rotary displacement is corrected by rotating pulls applied, *e.g.*, to a femur which is rotated outwards after a fracture, by passing a broad piece of adhesive plaster below the thigh up its inner aspect, and over the front of the limb, it holds by its adhesive surface; while to its free end, coming from below the limb, a weight of from 2 to 6 lbs. is attached, and tends to roll the limb inwards. Backward displacement can be corrected by a forward (vertical) pull, the cord of which is carried over a pulley attached to a rod, while forward displacement is overcome by a back-acting pull arranged by passing a broad band across the front of the displaced end of the bone, and then carrying the two ends of the band beneath the rollers of a small piece of apparatus, which lies beneath the patient's thigh or leg (*see* Fig. 2, left thigh); to



each end of the band a weight is attached.

It is a decided advantage to control the course of healing of a fracture by frequent X-ray examinations ; for the secondary pulls can then be varied in position as well as in direction, so that the best effect can be obtained. The main deformity of the chief fragments can be usually made out by palpation, and the direction required for these secondary pulls can be decided accordingly. Movements of the joints of the limb are commenced as early as possible, and from small degrees up to full movement. The circular strips of adhesive plaster, which hold the longitudinal extending straps to the limb by the pressure they exert, cause rapid absorption of the effused fluids, so that after a time they may require to be changed.

Quite recently, I have been using, instead of the adhesive plaster for the long pulls, straps of strong swansdown applied to the limb by means of a mixture of Venetian turpentine 1 part, rectified spirit 2 parts, as recommended by Professor Heussner, which I apply by means of a brush. The straps are then simply fastened on to the limb with a gauze bandage.

This has two advantages over the adhesive plaster. It is more quickly applied, and does not require the part to be shaved. But for the secondary pulls, the adhesive plaster over the top of the gauze bandage is used still.

From what I have seen of this method, I am sure that it is well worthy of the consideration of everyone who has to deal with fractures, and especially of the general practitioner. It is comparatively simple, and is easy of application, when once the principles of the secondary pulls are understood, but it requires a great deal of attention.

By this means one can restore the normal shape of a bone to a degree that can only be surpassed by the open method, and which, in the case of fractures by torsion, and fractures with a third fragment, can never be approached by the use of splints or the mobilising processes. I have had one or two cases in which union did not come about in the average time, and in which later I fixed the fragments through an incision, but this is not extraordinarily remarkable, for, now and then, failure to unite in the average time occurs after every method of treating fractures, and it is at times quite impossible to determine what it is that has prevented the union from coming about.

A CASE OF ACUTE INFECTIVE ENDOCARDITIS,  
TREATED WITH A VACCINE PREPARED  
FROM THE PATIENT'S OWN BLOOD, AND  
ENDING IN RECOVERY.

By A. F. R. CONDER, M.D., *Cheltenham*.

WITH REMARKS ON THE VACCINE TREATMENT.

By J. R. COLLINS, M.D., *Cheltenham*.

THE therapeutic use of bacterial vaccine is daily becoming more established, but so far there has not been fully recorded a large number of instances, in which this method of treatment has been applied to cases of acute infective endocarditis: and the following case is, I believe, the first of its kind to be placed on record in this country, in that the responsible organism was proved to be the *Diplococcus Lanceolatus* (*Pneumoniæ*) of Fraenkel.

Acute endocarditis would appear to be a not uncommon complication of acute pneumonia. Osler<sup>1</sup> found it present in 16 out of 100 autopsies, and in 11 of these 16 it was ulcerative in type. He further states<sup>2</sup> that it is "much more common in the left heart than in the right," and is particularly liable to attack those persons in whom the valves have been previously damaged: also that, when it occurs, it "seems to be of an unusually malignant type."<sup>3</sup>

Philip<sup>4</sup> states that 25 per cent. of the cases of ulcerative endocarditis are ætiologically related to pneumonia, and other authorities are in agreement with these views.

Fraenkel's organism has been isolated from the general circulation in a varying proportion of cases of acute pneumonia by different observers; but it seems to be generally admitted that the ease, with which this can be done is proportionate to the gravity of the infection. Probably there is a varying degree of bacteriæmia in every case, and the presence of the organism in the blood does not *per se* point to any endocardial infection, although, if the organism occurs in large numbers, it may be regarded as strong presumptive evidence of the occurrence of this complication, even in the absence of localising symptoms.

In the following case, I would point to the fact that the

repeated rigors and sweats, and the swinging temperature, were not due to the spreading of the pulmonary infection, as this did not increase after the fourth day of illness, neither was there any suspicion of localised suppuration occurring.

A gentleman, aged 43 years, heavily built, had passed the last twenty years in Civil employment in India. In childhood he had rheumatic fever which left a faint systolic murmur localised to the apex, and apparently mitral in origin. He had also had frequent slight attacks of malaria, which ceased two years ago. At about this time, he noticed that the urine was occasionally "smoky" after fatigue, and, on one occasion, he passed "practically pure blood." This hæmaturia was unaccompanied by symptoms, but, as it continued to occur from time to time, and as the urine contained oxalate crystals and a small quantity of albumen, the patient came home and took advice in London. His bladder was cystoscoped with a negative result, and he was regarded as suffering, in all probability, from early chronic interstitial nephritis.

He continued in good health, motoring and playing tennis, etc., until the end of October, when he felt feverish, and out of sorts for a few days, and, on November 1st, he was seen by my partner, Dr. J. W. Bramwell, who found him apparently suffering from a slight feverish cold.

On the following day, however, he became seriously ill; he had a rigor in the morning, and another in the afternoon, and now a slight cough had come on with scanty viscid rusty sputa. When the heart was examined, the soft faint systolic murmur was found to be replaced by a much louder and rougher bruit, which was heard all over the præcordia; his pulse was bad, and very rapid and irregular. Respiratory rate, 32 per minute. Temperature, 103° F.

On November 2nd Dr. Bramwell kindly asked me to see the patient with him at 5.30 p.m. He had had another rigor in the morning, and was worse. His condition was as follows:—

Propped up in bed, looking very ill, and cyanosis of lips, ears, and fingers marked. Temperature, 101° F. He complained of some pain at the angle of the right scapula, the ale nasi were active, but the breathing did not, considering his condition, seem seriously embarrassed.

*Respiratory System.*—Rate, 24 per minute. There was a short troublesome cough, and the scanty rusty sputa showed a few Fraenkel's organisms only; no tubercle bacilli. Coughing and deep inspiration caused pain at the right scapular region, but no friction could be found there. On inspection, the thorax showed nothing abnormal. On palpation, the vocal fremitus was increased over the right base. On percussion, there was some dullness anteriorly above the upper margin of the liver, and at the right base posteriorly, and there was a large area of dullness occupying the upper part of the right lower lobe posteriorly. To auscultation, the breath sounds over the area of dullness were bronchial in type, and not very loud, and there were a few scattered crepitations on inspiration.

*Circulatory System.*—No subjective phenomena. On inspection, there was marked pulsation in the epigastrium and in the veins of the neck.

On palpation, the apex beat was best marked in the 5th left intercostal space in the mammary line, it was weak and diffuse.



On percussion, the right border of the heart was found 2 inches from the mid-line in the 3rd interspace, and the left border just outside the nipple.

On auscultation, in the mitral area the 1st sound was replaced by a loud rough murmur propagated all over the precordia and towards the axilla: 2nd sound closed and sharp. In the other areas, the 1st sound appeared closed, but was masked by the mitral murmur, and the 2nd sound was closed and reduplicated in the pulmonary area.

*The Pulse* was exceedingly bad, and irregular in rate, rhythm, and force. The rate at the wrist was 112 per minute, but over the heart 160 systoles to the minute could be counted, so that roughly only two beats out of three reached the wrist. The vessel wall was slightly thickened, and the volume very poor. The patient's condition was too grave to allow of a tracing being made.

There was no dropsy, œdema, or jaundice.

*Hæmopoietic System.*—Lymphatic glands and spleen not enlarged. The blood film showed the erythrocytes large, well shaped and coloured, and a considerable leucocytosis chiefly affecting the polymorphic cells. Highest temperature, 102°. Leucocytes, 20,600 per cmm.

*Alimentary System.*—Teeth good, tongue moist, with thick white general fur; taking fluid nourishment well; patient constipated; nothing further of note.

*Nervous System.*—No headache or delirium, some irritability and restlessness; patient had scarcely slept for two nights.

*Urinary System.*—Nothing subjective, passing plenty of water. Urine acid, s.g. 1030; albumen, 4 parts per 1,000; no blood, sugar, bile, tubercasts, or oxalates. Deposit, heavy with urates.

During the day, no further rigors occurred, but the patient had two profuse sweats. He had another sleepless night, and much pain at the angle of the scapula, and at the right apex anteriorly; this was relieved somewhat by mustard leaves. He now had oxygen for ten minutes every half hour.

November 4th.—At 10 a.m., I withdrew 10 c.c. of blood from the right median vein with a sterile syringe, injected it into a flask of sterile bouillon, and handed it to Dr. Collins in the hope that he might be able to cultivate the infecting organism, and that from it a vaccine might be made with which to treat the condition.

The temperature was 101° in the morning, but rose again to 103° in the evening. The heart was distinctly weaker, the rate being from 150 to 160, while the radial pulse was about 88, and absolutely irregular. Little more than half the number of systoles were reaching the wrist.

During the day, several copious sweats occurred. The patient had another sleepless night.

November 5th.—Patient weaker, still taking nourishment well. At 3 p.m. Dr. Kirkland saw him with Dr. Bramwell and myself, and agreed that there was a slow patchy pneumonia of the right lung, but that the most important factor was the acute endocarditis, which we thought probably infective and due to the same organism which was the cause of the pulmonary condition. He agreed also that treatment by vaccine offered the best prospects, but we were not very sanguine as to the likelihood

of any growth taking place, or of the patient living long enough to give us an opportunity for trying it.

Treatment now consisted of fluid food and oxygen as before, with quinine, strychnine, digitalis, and citrate of soda by the mouth. The patient refused hypodermics. No alcohol was given. Morning temperature,  $101^{\circ}$ ; evening temperature,  $103^{\circ}$ . Another bad night was passed with only half an hour's sleep and much pain.

November 6th.—Dr. Collins reported a pure growth of Fraenkel's diplococcus, and at 12.30 p.m. the patient's opsonic index to his own organism was 1.01. The pulmonary signs were the same, and he had a further copious sweat in the morning with temperature  $99^{\circ}6'$  at 8 a.m. His heart was weaker, pulsations about 156 to the minute, of which about 60 reached the wrist. He was very restless and irritable, and got out of bed. In the afternoon he had an hour and a half of broken sleep.

At 11.30 p.m. I injected a dose of vaccine containing 50 millions of his own pneumococci; his temperature was  $102^{\circ}2'$ , and pulse rate 156.

Half an hour later he slept, and only awoke once during the next six hours, when he said he had much less pain and felt better. His pulse was now less irregular in force and time, and though still 145-150 heart beats were audible, about 100 of them caused a pulsation at the wrist.

November 7th.—At 11.30 a.m.: temperature,  $99^{\circ}4'$ ; pulse, 100; heart rate, 146, the heart evidently stronger and less embarrassed; O.L., 1.04. At

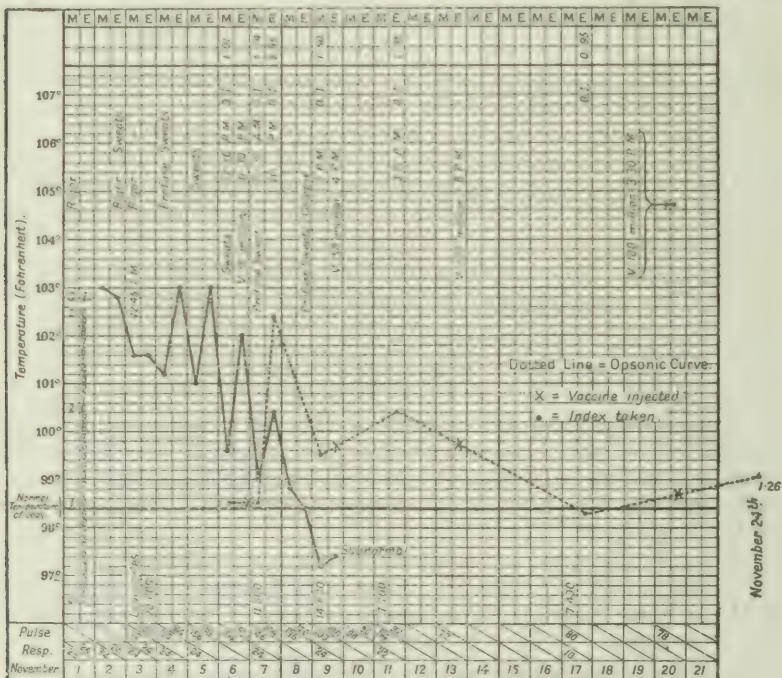


Chart showing temperature and opsonic curves, with dose and time of vaccine injections, and leucocyte counts.

10 p.m., after a restful day: temperature,  $100.4^{\circ}$ ; pulse, 144 over the heart and 120 at the wrist. The opsonic index had now risen to 2.90. He was taking nourishment well, and had some sleep during the day. No further sweats had occurred, and he had a fair though somewhat restless night. The lung condition had not altered.

November 8th.—At 10 a.m.: temperature,  $98.8^{\circ}$ ; heart rate, 140; pulse, 108, more regular in force and rhythm, but very weak: heart sounds very feeble, and the systolic murmur less marked though very rough. At 11 p.m. he was sweating and collapsed with an almost imperceptible pulse, but, by the help of strychnine and digitalin hypodermically, and hot black coffee by the mouth, he rallied, and I was able to leave him at 4 a.m. with a comparatively easy mind.

November 9th.—Much better; heart rate and radial pulse equal at 100 per minute. Systolic murmur very rough, but less widely distributed.

Opsonic index at 1 p.m. = 1.5. Vaccine, 50 millions injected. From this point the patient made an uninterrupted recovery. On the 11th his O.I. was 1.96; on the 13th, vaccine, 100 millions injected; on the 17th, O.I. .95; 20th, vaccine, 100 millions; 23rd, O.I. 1.28.

After this date, as the infective process seemed at an end, vaccine was not again used, nor was the index again estimated. After the temperature fell, the lung condition rapidly cleared up and became normal. When the patient began to take a mixed diet again, and especially when he began to take exercise, the urinary signs, which had been in abeyance since the onset of the acute illness, returned, with a specific gravity of about 1018; a trace of albumen was constantly present, oxalate crystals, sometimes profuse, sometimes less so, with few or numerous erythrocytes. These signs, however, gradually lessened, and an occasional trace of albumen is now all that is to be found.

The dilatation of the heart passed rapidly away, but the new murmur persisted, though it became somewhat less loud and less widely distributed as the heart recovered. When the patient was last seen, eight weeks after the onset of his illness, his apex-beat was well inside the nipple; the first sound was replaced by a rough loud murmur, heard all over the precordia, and conducted towards the axilla, but best heard at the apex. The pulse rate was 84 per minute, with a beat occasionally lost.

I have heard from him recently that he is in good health, and free from symptoms of circulatory trouble.

The diagnosis of acute infective endocarditis in this case was based upon:—

- (i) The evidence of former valvular disease.
- (ii) The presence of acute pulmonary inflammation.
- (iii) The occurrence of repeated rigors, and subsequently repeated profuse sweats.
- (iv) The sudden development of a loud *rough* cardiac murmur in the course of the pneumonia.
- (v) The irregularity of the temperature.



- (vi) The extreme embarrassment of the heart.
- (vii) The ease with which the organism was obtained from the blood.

The diagnosis has been, I think, confirmed by the persistence of the loud rough mitral murmur, and was originally concurred in by two experienced observers in the persons of Dr. Bramwell and Dr. Kirkland.

The prognosis of pneumococcal endocarditis would appear to be exceedingly unfavourable, and the treatment by vaccine seemed amply justified. What the general opinion of those qualified to judge upon the part played in this patient's recovery by the vaccine will be I do not know, but the result has been sufficiently promising to encourage a further trial, should occasion arise.

The only fully recorded case of acute endocarditis treated in this manner which I can find is one published by Barr, Blair Bell, and Douglas in the *Lancet*, 1907, Vol. I., p. 499. This case was streptococcal in origin, and also ended in recovery. Horder,<sup>6</sup> however, in an interesting paper in this Journal, has doubted whether there was sufficient evidence in this case to make the diagnosis certain. His paper also contains a brief account of the subject in general, and of one case of influenzal endocarditis, treated by a vaccine and recovering.

For the identification of the organism, the preparation of the vaccine, and suggestions as to suitable doses, and the estimation of the opsonic indices, I am indebted to Dr. Collins.

How far the treatment by vaccines can be controlled by observation of the opsonic index remains at present *sub judice*, but in the present case it was the only available guide. The leucocytosis did not appear to bear any relation to the opsonic index.

#### NOTES BY DR. J. R. COLLINS.

I have been asked by Dr. Conder to append a note to the record of the case described above, in regard to the vaccine therapy employed.

The question arises, was the successful result due to the vaccine inoculated? The following quotation from

Dr. R. W. Allen's book on Vaccine Therapy<sup>1</sup> is pertinent :—  
"MacDonald studied the index in eight cases of pneumonia, and found that, while the temperature is rising and during the *fastigium* the opsonic index is below normal, whereas, at the outset of the crisis, there is a sudden rise, even as high as 1·6. Subsequent observations have shown that, in very severe cases, failure of the index to rise in this manner at the crisis is a matter of very grave importance, and that such cases usually die."

In the case here recorded, it will be noted that the condition was not a localised pneumonia, but one of pneumococcal septicæmia, with serious involvement of the endocardium. Seeing that elevation of the index does not occur spontaneously in very severe cases, in which the lungs only are involved, we may argue, *a fortiori*, that it would not occur in a case of general infection.

From experience with several cases of general infection with other organisms, I would expect neither a crisis, in such circumstances, nor any marked elevation of the opsonic index. The first two observations of the index, 1·01, and 1·04, are against the subsequent rise being produced spontaneously, but they harmonize with the view that the subsequent rise was the direct effect of the inoculation. The results of the later inoculations support this opinion.

Dr. Conder raises the question of the value of the opsonic index as a guide in vaccine therapy. This is not the place to discuss this subject ; but, after the estimation of three thousand indices, I am confident of its value ; and that any inaccuracies which may occur, are due to some fault in the taking of the blood or in the technique of the operator, and not to any blemish in the method itself.

I should have been sorry to have undertaken the grave responsibility of determining when and in what dose to inoculate a potent vaccine into a patient in this critical condition without the information afforded by the opsonic index.

This whole subject is clearly stated in numerous valuable articles in the May number of THE PRACTITIONER for last year.

It is very important that a fairly large quantity of blood

should be taken, when trying to cultivate an organism from the blood, as it is seldom that bacteria are so numerous in the circulation as to give a high probability of finding the organism in a small sample. The fact that the culture of vaccine obtained was a pure one is a testimony to the excellence of Dr. Conder's technique.

I would urge the importance of using vaccines early, before the patient is so saturated with toxins as to be unable to react satisfactorily, and not to wait until all other measures have been tried and have failed. When it is realised by the Profession generally, that there is just as much urgency in using vaccines as there is in the employment of antitoxins, more uniformly successful results will be obtained, and deaths from general septic absorption will be rarer both in Medicine and Surgery. Finally, I will quote Dr. A. Butler Harris<sup>1</sup> on Vaccines in Pneumonia: "I am bound to believe that before long this treatment will be recognised as sure for pneumonia as the antitoxin is for diphtheria."

<sup>1</sup> Osler: *Principles and Practice of Medicine*, 1901, 4th Edit., p. 115.

<sup>2</sup> *Ibid.*, p. 124.

<sup>3</sup> *Ibid.*, p. 700.

<sup>4</sup> Gibson: *Text-book of Medicine*, 1901, Vol. I., p. 238.

<sup>5</sup> See Da Costa: *Clinical Hematology*, 1901, p. 411.

<sup>6</sup> Horder, T. J.: THE PRACTITIONER, 1908, Vol. LXXX., No. 5, p. 714.

<sup>7</sup> *Vaccine Therapy and the Opsonic Method of Treatment*, by R. W. Allen, Ed. 2nd., p. 167.

<sup>8</sup> THE PRACTITIONER, May 1908, p. 649.

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## THE DIAGNOSIS OF PERMANENT MENTAL DEFICIENCY IN INFANCY AND CHILDHOOD.

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THE medical man, and nowadays especially the school medical officer, has frequently to decide whether an infant or a child has possession of its full mental powers or not, and in many cases it is by no means easy to give a definite opinion.

According to Dr. Tredgold, in England and Wales alone there are 140,000 persons suffering from original mental defect (apart from the insane)—a proportion of 1 to 248 of the population; these figures serve to show that this condition is far from rare, and the problem of the diagnosis of such cases becomes very real to a medical man dealing with large numbers of children.

Before entering into a discussion of the diagnosis of mental deficiency in infancy and childhood, it will be of advantage to give definitions of what is meant by that term and also to describe briefly the various types.

Briefly, the term Mental Deficiency (Amentia), as now used, means permanent want of sense. There are three degrees:—

- (a) Idiocy, or very great mental deficiency;
- (b) Imbecility, or considerable and marked mental deficiency;
- (c) Feeble-mindedness, or lesser but nevertheless definite and permanent mental deficiency.

In all definitions the permanency of the mental deficiency should be emphasised to distinguish this condition from temporary mental affections and from backwardness or retarded mental development due to adverse factors in childhood and infancy as distinguished from the ineradicable mal-development to which amentia is due.

The definitions of these conditions, suggested by the Royal College of Physicians of London and adopted by the Royal

Commission on the Feeble-minded, are :—

A feeble-minded person is one who is capable of earning a living under favourable circumstances, but is incapable, from mental defect existing from birth, or from an early age, (a) of competing on equal terms with his normal fellows ; or (b) of managing himself or his affairs with ordinary prudence.

And feeble-minded children under the age of 16 years come under the jurisdiction of the education authorities, being described as "those children who, not being imbecile, and not being merely dull and backward, are, by reason of mental defect, incapable of receiving proper benefit from the instruction in the ordinary public elementary schools, but are not incapable by reason of such defect of receiving benefit in such special classes or schools as are in this Act mentioned."

"The imbecile is one who, by reason of mental defect existing from birth or from an early age, is incapable of earning his own living, but is capable of guarding himself against common physical dangers."

"An idiot is one so deeply defective in mind from birth, or from an early age, that he is unable to guard himself against common physical dangers."

These two latter definitions are from Sollier, and all four are quoted by Tredgold in his book on *Mental Deficiency*.

The well-defined types most frequently met with in infants and children are :—(1) Microcephalic, (2) Mongolian, (3) Cretinoid, (4) Epileptic, (5) Hydrocephalic, (6) Cerebral Diplegic. But there are many cases that cannot be put under any of these headings, for they do not conform to any well-defined type, though there is no doubt about the mental deficiency, and the children exhibit many of the physical and mental stigmata to be described later. Such cases form a large proportion of the mentally defective seen at a children's hospital and at schools for mentally defective children.

The description of each of the well-defined types given here will be brief, no attempt being made to consider ætiological factors. For fuller accounts, references must be made to books on the subject, such as, *Idiocy and Imbecility* by Ireland, 1898; *Mentally Defective Children*, Shuttleworth ; *Mental Deficiency (Amentia)*, Tredgold, 1908.

(1) *The Microcephalic Type*.—The striking feature of this

type is the exceedingly small head, which on measurement is often only 15 to 17 inches in circumference. This may be combined with some spasticity of the limbs, marked constipation, and other symptoms due to under-development of control by the nervous system. Lesser degrees of microcephaly may not show any physical defects beyond the small head. The skull closes very early, and this has been put down as the cause of the condition, but there is no doubt that the under-development of the brain is the primary malformation, the operation of craniectomy proving of no avail in these cases.

These children at the first glance appear bright and quick to the untrained eye, but though their movements are often unusually rapid, there is little or no ordered intelligence to guide their actions. Such children are often of uncontrollable temper, and, though not as a rule violent, are very easily thrown off their balance, crying or screaming loudly on little provocation.

The normal circumferences of children's heads, according to Ashby and Wright, are :—At birth 14 inches, at 6 months  $16\frac{1}{2}$  inches, at 1 year 18 inches, at 2 years 20 inches, at 4 years 21 inches, and at 10 years  $21\frac{1}{2}$  inches.

Cases.—H. C., æt. 2 months. Microcephalus, head circumference  $13\frac{1}{2}$  inches, accessory auricles, cleft soft palate, slight congenital heart malformation. The other children are strong mentally and physically. The mother's sister is in an asylum at present. The mother was very ill and much worried during pregnancy; during her former pregnancies she was not ill.

There is little doubt that this child will be a microcephalic imbecile. Interesting points are the family history, the history of illness of the mother during pregnancy, and the presence of multiple congenital deformities.

L. W., æt. 2 years 2 months. Microcephalus, head circumference  $16\frac{1}{2}$  inches; family history negative; mother well during pregnancy, labour very easy and rapid; child cannot walk or talk or make any attempt at either; is always crying; has no control over the sphincters; shows strabismus, and is well developed physically but the limbs are slightly spastic.

M. H., æt. 3 months. Microcephalus, head circumference 12 inches; family history negative, and mother well during pregnancy; no history of convulsions, no spasticity, constipation obstinate; weight 6 lbs. 8 ozs.; anterior fontanelle closed.

In the last case the closure of the anterior fontanelle at such an early age, combined with the small circumference of the head, points very strongly to a diagnosis of microcephalic imbecility.

(2) *Mongolian Imbecility*.—This form of mental deficiency



is by no means an uncommon one, and, though the deformities are quite characteristic, as a rule only the specialist is capable of diagnosing this condition even in the later years of childhood. Once the curious featural deformities of a Mongol have been impressed on the memory, there is little difficulty in recognising other cases; but, unfortunately, all attempts at photographing these have given very poor results, even in marked cases. The name Mongolian is given to this condition because of the resemblance these cases bear to the featural conformation of the Mongolian race; thus they have small round heads of smaller circumference than the normal child, obliquely-placed eyes and eyebrows, the bridge of the nose is markedly depressed, and the tongue is generally protruded in a most characteristic manner; the ears are generally small and shell-like; and not uncommonly there are prominent epicanthic folds at the inner angle of the eyes; the hands are often misshapen, in marked cases being broad and short with the fingers radiating outwards. These children may show other congenital deformities, of which heart malformation is worthy of special mention. As infants they may be very small and under-developed physically. (*See Case A. H.*) Mentally they are definitely lacking in intelligence, but may be happy and smiling, whilst they often show a curious and marked liking for music. Like other imbeciles, they are late in learning to walk and talk, and their mental deficiency may be noticeable at an early age, since the physical configuration is the most striking and, to a skilled observer, quite characteristic even in the early months of life. A combination of Mongolism and Cretinism may occur, but is unusual.

A. H., æt. 7 months, Mongolian imbecile. Head circumference 13½ ins., tongue protruding, though normal in size, depressed bridge nose, Mongolian features, hands normal, heart normal. Height, 19 inches; weight, 6 lbs. Youngest of large family, all the other children strong mentally and physically. Father's brother in an asylum. Mother out of mind for 9 weeks during pregnancy.

At a glance it was possible to say that this child was a Mongolian imbecile from the features. The child was very small and weak, as the height and weight show. It is interesting to note the family history of insanity. Although the circumference of the head was so small, it was not particularly small in proportion to the rest of the body, and the features showed that it was a case of Mongolian imbecility and not microcephaly.

Those unaware of the featural configuration of the Mongol

might class such a case under wasting and general atrophy, but there was no wasting, only a general smallness and lack of growth.

(3) *Cretinism or Congenital Myxædema*.—This condition differs from the other types in that it is due to a deficiency in the thyroid gland, and not a primary affection of the brain. It is possible to alleviate this condition by a therapeutic remedy—the thyroid gland extract.

Physically, these cases do not exhibit the stigmata of degeneration as frequently as the other types, but they show well-marked and characteristic changes, the most noticeable abnormalities being extreme coarseness of feature, a rough, dry skin, a harsh voice, a large, clumsy tongue, dry, poorly-nourished hair, subcutaneous swellings over each clavicle, protuberant abdomen with a low umbilicus, short, square hands, and (what is perhaps the most marked feature in the majority of the cases) great stunting of the body and limbs. The thyroid gland is not present, or is so small that the trachea can be felt much more readily than in other children. There is usually marked constipation. Mentally the cretin is extremely dull and listless, moving very slowly and having, as a rule, very little power of independent thought or volition. The condition is one of hebetude and apathy, and, if untreated, such a child becomes a hopeless imbecile, docile enough, as a rule, but not fit to form a useful member of the community.

Slight degrees of cretinism are not uncommon in children; probably they are much more common than is generally supposed, though they are not always of congenital origin. In these cases stunting and delayed growth are the most marked features, combined with mental dulness and apathy. Deficiency of the thyroid gland is a more common cause of dulness and backwardness in childhood than has up to now been supposed, and it is quite justifiable to try the therapeutic effect of doses of thyroid extract as an aid to diagnosis.

G. F., æt.  $\frac{27}{2}$ . Undersized, coarse, dry skin and hands, harsh voice, dry, poorly-nourished hair, marked constipation, no thyroid gland to be felt, general appearance cretinoid. The father's mother had Derbyshire neck. The other child of the family is normal.

This child, G. F., was put on thyroid gland tablets, gr.  $1\frac{1}{2}$ , daily, and

improved beyond all recognition in two months. The height increased, the child became bright and alert, and the constipation disappeared.

It is interesting to note the family history of goitre.

N. B., æt. 5 years, is now bright mentally as she has been taking thyroid extract for three years. Three years ago she was in the Pendlebury Hospital under Dr. Ashby, and her condition then was described as vacant, with a protruding tongue and a prominent abdomen; no thyroid gland could be felt, the hair and skin were coarse and dry, the voice gruff, the hands broad, fat, and coarse, the circulation poor, and the height 29½ ins., the weight 25 lbs. 2 ozs. Under treatment with thyroid extract the improvement was very marked, and this has been maintained up to the present time.

The mother has exophthalmic goitre.

Instances of the slighter form of thyroid deficiency, which is by no means uncommon, are—

H. C., æt. 1 year 5 months. Delicate and backward, has made no attempt at talking or walking, abdomen large, marked constipation, no signs of rickets, height 2 ft. 4 in., weight 18 lbs. 8 ozs. on May 7th. Treated with extract of thyroid gland, 1½ gr. daily. May 13th, marked improvement, much more lively, and has begun to walk, the constipation is much better, and, as the mother says, there is a "wonderful change."

(4) *Epilepsy*.—The connection between epilepsy and mental deficiency is complicated by the fact that many mentally defective children are also epileptic. Epileptic fits can cause a good deal of mental dulness, especially if the fits are frequent, though, of course, it is necessary to exclude dulling due to bromides given for the fits. On the whole, permanent mental deficiency following and caused by epilepsy is not a common condition in childhood, and when the two are seen combined in the same patient it is probably an example of a mentally deficient child suffering from epilepsy. The question of the hereditary ætiological effect of epilepsy is another matter.

(5) *Hydrocephalus*.—Hydrocephalus may be a cause of mental deficiency, whether it is acquired or of congenital origin. Mental deficiency is by no means a necessary concomitant of hydrocephalus, some of these patients being quite intelligent, but in cases of a chronic and long-standing nature, where there is a good deal of pressure on the brain, mental changes commonly supervene. Hydrocephalics are docile and gentle, but often very sensitive to noise and easily upset.

F. H., æt. 11 months. Hydrocephalus marked, enlargement began at 3 months, head circumference 23 ins., no other deformities. Mentally the child is backward, but seems to be intelligent when she is at her best.



Here the atrophy and arrest of growth of the brain caused by the increased intra-cranial pressure tends to produce a progressive mental dulness, though there is no congenital under-development of the mental powers.

(6) *Cerebral diplegia* is another condition in which there is generally accompanying mental deficiency, but here the mental deficiency is caused by an organic lesion occurring at birth. These children show more or less rigidity and increased reflexes, with contractures in some cases; they are very much given to slavering. The mental condition is often that of idiocy, though it is not necessarily bad and may be very little different from normal. There is generally the history of prolonged labour at the birth of the child.

The following case illustrates this condition:—

J. D., æt. 3½. Cannot walk or talk though attempts a few words; always slobbering; obstinate constipation; head 20 inches in circumference; difficult birth prolonged and instrumental; convulsions at birth; legs somewhat spastic; knee-jerks increased; Babinski present.

Mental deficiency may follow meningitis if the child survives, and in some cases it has been known to follow the acute infectious diseases, such as measles or scarlet fever, but there is often an inherited instability of the nervous system which is ill fitted to withstand the attacks of any disease that may affect the child.

*Routine Examination of a Case.*—The following points should be noted when examining a child for mental deficiency:—

- (1) The family history.
- (2) The health of the mother during pregnancy.
- (3) The personal history of the child, including troubles at birth.
- (4) The presence or absence of physical stigmata.
- (5) The height and weight.
- (6) The speech.
- (7) The sight.
- (8) The hearing.
- (9) The ability to sit up, walk, and to control the sphincters, and the age at which these powers developed.
- (10) The age at which the child began to talk.
- (11) The memory, attention, will, and temperament.
- (12) The standard in which the child is, the powers of reading, writing, arithmetic, and of performing manual tasks.

We shall proceed to consider these points in greater

detail.

(1) A family history of insanity, epilepsy, or mental deficiency is of more importance as an aid to the diagnosis of mental deficiency in the child than are histories of tuberculosis, alcoholism, or syphilis, though in my experience tuberculosis is frequently a marked feature in the family histories of these children.

(2) The health of the mother during pregnancy is an important point, because a history of illness during pregnancy is often noted, and it is quite possible that ill-health of the mother during the period of development and growth of the fœtus may have some effect, though it in itself cannot cause mental deficiency in the offspring.

(3) The personal history of the child may show some illness or accident which has acted as a determining factor in producing mental trouble, but this is the exception, although in a great many cases the parents attach exaggerated importance to some such supposed cause.

(4) The physical characteristics and general configuration of the child, especially the conditions mentioned above, such as mongolism, cretinism, hydrocephalus, should be looked for, and often it is possible for the skilled observer to tell at a glance that the child is mentally deficient. The circumference of the head should be taken and compared with the normal, and the presence or absence of other physical stigmata of degeneration noted.

The mentally deficient show the physical stigmata of degeneration more commonly than do children of normal intelligence, and not infrequently a combination of one or two defects is seen, but it must be distinctly understood that such stigmata are not in themselves evidence of mental instability, though their presence does point to an inheritance of the neuropathic diathesis.

The important stigmata of degeneration are :—(a) Asymmetry and other deformities of the head. (b) Epicanthic folds at the inner canthi of the eyes.<sup>1</sup> (c) Abnormalities in

<sup>1</sup> Epicanthic folds are ridges of skin starting from the skin below the eyebrow and continued round the inner canthus of the eye. They may be either symmetrical or only present on one side. They must not be confused with the plica<sup>s</sup> semilunaris.

the shape of the external ear. These are very common and of various types, defective lobules being the most common. (d) Abnormalities of the palate and the dental arch, the palate being often highly arched or even V-shaped. This has been said to cause deficiencies in speech, but it has little or no effect in that direction. (e) An incurving of the little finger more marked at the terminal joint has also been observed. (f) Cold extremities.

Other deformities have been described as stigmata of degeneration, but the above are the most important.

Defects of the general balance and carriage are very common, being due to the under-development of muscular control, just as are many of the other defects observed, such as imperfect speech.

The expression of mentally deficient children has something that is characteristic though impossible to define exactly. A practised observer finds great help in making his diagnosis from the general expression on the features of the child, even though he cannot point out any one defect. The presence of vertical furrows between the eyebrows, described as corrugation, is often seen in these cases. Defects in carriage, such as hunched-up shoulders or nervous twitchings and habit spasms, are not of sufficient importance to need more than a passing mention.

(5) Comparison of the heights and weights of mentally defective children with those of ordinary school children show that the former are smaller and less developed physically, possibly because they often do not get the same opportunity for exercise and play, but the difference is too marked for that to be the only cause; also the difference increases with age. In the same way the size of the head is distinctly less in the mentally deficient, and the disparity between their heads and those of ordinary children increases with age.

Of course in dealing with the mentally deficient we are not necessarily dealing with idiots or imbeciles, so we shall not find such marked differences in measurements; and, taking the average of a large number of cases, the difference is too small to be of use in diagnosis when the slighter forms of mental deficiency only are being considered.

In infancy or in the early years of life marked under-



development of the head is a very useful point in diagnosis, but then the case is probably one of more marked mental defect.

A curious point about the asymmetry of the skull exhibited by these children is that the right side is usually the larger.

(6) Speech.—Test the power of speech if it has developed, and also enquire at what age the child began to speak. Mentally defective children usually begin to speak much later than do normal children. Taking the average of 156 of my cases, they usually begin to talk about the age of 2·4 years. This lateness in the development of speech, combined with lateness in beginning to walk, is an important aid to the diagnosis of mental deficiency, and I shall refer to it more fully later.

Defective speech is very common among the mentally deficient, and may be due to various defects, either of the receptive paths, the central powers, or of the emissive apparatus. I have previously discussed this subject in full<sup>2</sup> and do not propose to give more than a brief summary here.

These speech defects are much more commonly due to want of development of the central controlling powers than to organic lesions of either the receptive or the emissive paths, so there is no reason why the child should not speak properly if the powers of attention, will, and understanding can be concentrated, but it is just this difficulty that we meet with in the mentally deficient, who are so constituted that it is very difficult to get them to apply themselves to any task.

To test the defects of a mentally deficient child's speech is by no means easy, but in so doing the examiner gets a very good idea of the child's mental capacity. The results of the analysis of the speech defects of 59 cases show that substitution of consonants or lalling is the most common and noticeable defect, and that the more difficult consonants are the ones to be replaced by others more easily pronounced. After Th, R and Y are the most common stumbling-blocks, and then, in order of frequency, S, G, Ng, Sh, K, V, L, F, Z, W, P, N, D, T, N, M, B, the latter ones being much less frequently a difficulty than the former ones.

When the methods of production of some of the more

<sup>2</sup> "Feeble-mindedness in Children," *Medical Chronicle*, September and October, 1905.

difficult consonants are studied, it will be seen how very easy it is for a careless or inattentive child to substitute allied consonants for one another, and this is what occurs:—Y replacing R, as “Yabbit” and “Yaining,” or T replacing K, as “Toat” and “Tollar,” or D replacing G, as “Dood” or “Dirl.”

The study of these defects is interesting, and anyone wishing to find a more complete account is referred to the article mentioned above,<sup>1</sup> where there is a bibliography.

(7) Sight.—Test the sight to see if there is any major defect that might possibly account for under-development of the mental faculties.

When dealing with infants this can be done by showing them a bright light, care being taken that it is not the movements made to put the light in position that make the child look round. In older children extreme degrees of short sight may have a dulling effect, but it is seldom that such cases are thought to be mentally deficient.

Colour-blindness should also be tested for, but, if present, it is not, as a rule, due to faulty sight, but to the failure to appreciate the abstract idea of a colour and to learn the names that stand for a colour, or even that the name means a colour. I have examined a large number of cases for colour-blindness and find that the majority could match colours, though a large number could not name the colours correctly.

(8) Hearing.—This sense must always be carefully tested, and it is by no means easy to do so in many cases, because, in dealing with infants, it is often difficult to tell whether the child has heard or not, and in older children want of attention or stupidity may render the testing of the hearing powers very difficult indeed.

In testing infants, the observer must make sure that they hear at all. A bell, or some such instrument, will make them look round, but care must be taken lest they see the bright object or feel the air-currents produced by the movements (such as clapping the hands) necessary to make a noise. In testing older children, by speaking words or sentences, gestures must be avoided, as some children are very quick at interpreting gestures.

A notable example of the difficulty of testing these children

is shown in one of my cases, where no ringing of bells or clapping of hands produced the slightest effect, but the sound of a penny dropping on the floor made the child turn round instantly. In this case the hearing was quite good, but the power of attention was very poor.

(9) and (10).—A very valuable index to the rate and amount of mental development is given by noting the ages at which the child learned to walk and talk, if he has developed those powers. Preyer states that the normal age is from nine to fifteen months.

Mentally defective children are usually late in developing these powers, speech being more delayed than walking. There is evidently some delay in the opening up of the afferent or efferent paths, or of the development of control by the central powers. Certain physical infirmities, such as otitis, rickets, tuberculosis, and marasmus, may have a retarding effect; but late development of speech, or of muscular control, is always to be regarded as a cause for anxiety for the future mental state of the child.

TABLE.

| Classification of Case.        | Average Age Walk. | Average Age Talk. |
|--------------------------------|-------------------|-------------------|
| 61 cases classed as "Good" -   | 1'5 yrs.          | 1'8 yrs.          |
| 44 cases classed as "Medium" - | 1'8 yrs.          | 2'0 yrs.          |
| 50 cases classed as "Bad" -    | 2'2 yrs.          | 3'5 yrs.          |

All these 155 cases were mentally deficient, but only feeble-minded, and not imbeciles or idiots, so the figures, though striking enough, are not so striking as they might have been had idiots and imbeciles been included. The degrees of mental deficiency were estimated as "Good," "Medium," and "Bad," independently of the taking of the history. The figures show conclusively that the greater the degree of mental deficiency, the later the child will learn to walk and talk, and they bring out the importance of these points as an aid to the diagnosis of mental deficiency.

Again, a deficient or delayed development of control over the sphincters is often found, and, like lateness in



walking and talking, it is probably the result of imperfect sensation, or of ineffective development of the efferent paths to the muscles. As a symptom aiding in the diagnosis of mental deficiency it is of considerable value, especially in the earlier years of life. Later on, in childhood and in the lesser degrees of mental deficiency, it is not so often met with.

In the same way, habits, such as eating clay or dirt and biting the fingers, are generally confined to the greater degrees of mental defect, where there is no doubt as to the diagnosis.

The entire absence of self-consciousness and shame is often seen, and, though perhaps better for the happiness of the child, it leads to untidiness and dirty habits.

(11) Memory is very difficult to estimate, and perhaps the best and most readily obtained guide to the estimation of this faculty is found by asking whether the child can go simple errands.

Power of attention is necessary for mental development, which can hardly take place until the paths to the brain are opened up so that the attention can be gained. The power of concentrating the attention enables the child to acquire knowledge, the impression made on the mind by any experience varying greatly with the degree of development of that faculty. In this way, a stolid, slow child will, because he is focussing his attention on one impression to the exclusion of all others, make more use of that impression than will the quick and apparently clever child, who receives a large number of imperfect impressions but gains little knowledge therefrom.

Many of the mentally deficient have very poor power of attention, and spend their time either in rapid inconsequent actions, the result of a wandering attention, or in a state of apathy and indifference. A child of the former type is always moving about but leaves everything unfinished; he may begin to write on some paper, but seeing the fire will run towards it, perhaps being attracted on the way by some other object. Such a child may be thought to be deaf because he does not always respond when called, but in the majority of cases it is possible to differentiate want of attention from deafness. A child of the latter type is prevented from showing any degree

of attention by the dull inertia of the brain, and many of these children have no power of initiation or volition, for they will sit still doing nothing unless constantly prodded to fresh efforts by their teachers. They are like the old village loafer, who, when asked how he passed his days, replied, "Well, sometimes I sits and thinks, and sometimes I just sits."

Also, these children show deficient will power, they cannot apply themselves to a task, and try over and over again.

The most common temperaments are the phlegmatic and sanguine; the phlegmatic child drifts along taking everything as it comes with very little real interest, and the sanguine child is apparently bright and lively but shows very little after-effect, being impressionable, changeable, and subject to sudden outbursts.

(12) *Standard at School.*—According to Dr. J. Thomson, a child should be in the First Standard at 7-8 years, the Second at 8-9, the Third at 9-10, the Fourth at 10-11, the Fifth at 11-12, the Sixth at 12-13, and the Seventh at 13-14, and, if he cannot pass the Fourth Standard at 14, he is generally mentally defective.

Although it is impossible, on account of the varying conditions of environment and health, to form a definite opinion from the data concerning the scholastic attainment, such information is of great value; it must, however, be remembered that some of the better class of feeble-minded are capable of acquiring a fair amount of knowledge and manual skill.

The progress in reading and writing, if any, is of value in the diagnosis of mental defect if the child has had a fair trial in the usual methods of teaching. It is both the manner in which these actions are performed, and the results, that indicate the mental state of the child. A nervous child will hesitate or refuse to begin, but an impulsive, careless child will hurry on regardless of mistakes. The merely backward child is often ashamed of his inability to read, and may show this, while a noticeable characteristic in many of the mentally deficient is that they show no sign of being ashamed of their condition; perhaps this is a blessing in disguise.

In the same way the writing may be a good index of the child's character. Some children write the first few letters well and then go off into an indefinite scrawl; a peculiar mistake is

the substitution of "god" for "dog," quite a number of these children making this mistake.

*Addition.*—Few of the feeble-minded get beyond simple addition, the power of calculation being as a rule very poor indeed. With beads and bricks instead of numbers they may do better, but even then they are woefully deficient.

*Manual Tasks.*—Here we get to the brightest part of the testing of these children. No longer struggling with an abstract idea but confronted with a concrete object, the child is more stimulated to an effort, and though the result of his effort is nothing like that of a normal child, nevertheless, as the faculty of imitation can here have full play, these children may do comparatively well. When used as a means to prevent the intellect from lying fallow, training by manual tasks forms a great aid to treatment and care of these children.

When actually testing the mental capacity of an older child the following methods are convenient :—

A number of coloured wools or papers, the colours being definite and the contrasts sharp, some bricks and slabs of wood in sufficient number to allow of their being used for addition and subtraction, a pencil and notebook, and various small objects or drawings useful for testing the child's knowledge and powers of speech.

With this apparatus it is easy to gain an accurate knowledge of the child's powers of addition or subtraction, of writing, reading, and of speech, while at the same time the examiner can note and analyse the causes of the mental defect. If necessary the speech can be tested much more fully, and for the method of doing this the reader is referred to the article mentioned above.<sup>1</sup>

The examiner must be careful not to repeat the word before the child, for in seeing whether the child can pronounce a word correctly, it is necessary to show him an object representing the word, and not to ask him to repeat the word he hears, because the powers of imitation may come into play, the child repeating the word correctly without understanding its meaning.

*Conclusion.*—The diagnosis of the slighter forms of mental deficiency, *i.e.*, of less degree than imbecility or idiocy, is not as a rule made during the earlier years of life, unless the child conforms to one or other of the well-recognised types, and it



must be remembered that the majority of the cases do not conform to a well-marked type. Inability to sit up, lateness in learning to walk and to talk may excite the alarm of the parents, but these symptoms are put down to mere backwardness, and even after a careful examination the medical man cannot give a definite opinion as to the future mental state. But the diagnosis is easy in the early months of life in the major forms of mental deficiency, especially if the child conforms to one of the well-recognised types.

A skilled observer can at once recognise a Mongol, a cretin, and a child of the microcephalic or hydrocephalic type, in the latter two cases justifying the diagnosis by the tape-measure. A word of warning is necessary concerning the large square skull of rickets, which may be mistaken for hydrocephalic enlargement.

The first thing to do is to exclude deafness and blindness, and great importance is to be attached to the amount of response to external stimuli and to the general liveliness and expression of the infant, though it is the lateness in the development of the physical powers that excites the alarm of the parents. These symptoms of delayed muscular control are also of great importance as an aid to diagnosis in cases where the mental powers are thought to be lacking.

That the infant is late in sitting up, that he shows very little response to external stimuli, that he is below the average in height and weight, with the presence of many of the physical stigmata of degeneration, a family history of feeble-mindedness or of insanity, small circumference of the head, and poor development of control over the sphincters or the general muscular system, are all points suggestive of mental deficiency, and should be carefully noted in each case.

Great irritability and a strained look about the eyes may point to mental deficiency, but in these cases it is necessary to exclude all conditions giving rise to pain in the head, such as otitis, intra-cranial tumour, and meningitis. The following is a case in point:—

W. C., strong well-developed boy : head  $19\frac{1}{2}$  ins. ; very restless, and always crying, screaming, and banging his head ; much worse at night. Cannot walk yet, age being 1 year 7 months ; says very few words. Family history negative. No signs of any organic disease.

It is difficult to give a diagnosis in a case like this, but I

have grave doubts of the future mental capacity of this child.

It must be remembered that late or under-development of function may be due to other conditions, such as wasting, rickets, deafness, and blindness, so it is not always easy to give a diagnosis, still if the various conditions mentioned above are noted, it is generally possible to form a correct estimate in the early years and in many cases in the early months.

Cases of interest are :—(1) F. P., *æt.* 1 year ; cannot sit up ; head 18 inches. On examination the back muscles are found to be abnormally weak, and as the child smiles and crows, can shake hands, and has already developed some control over the sphincters, it is quite evident that the inability to sit up is due to weakness of the muscles, and that the child is not mentally deficient. This child improved very much and is now normal. (2) A. B., *æt.* 4 months ; tongue always protruding, otherwise the infant seems normal, except for attacks of dyspnœa caused by the tongue,

This case (2) at first sight might be mistaken for a case of Mongolism, but an examination shows that it is an example of macroglossia. I mention this case because a medical man suggested to me that it was a case of Mongolian imbecility.

M. C., *æt.* 1 year ; weight 16 lbs. 12 ozs. ; epicanthic folds marked ; head 18 inches ; can only just sit up and that for a short time ; no attempt at walking ; has said "mamma" and "dadda," and recognises parents readily. No attempt at control over sphincters yet. Family history negative, no convulsions, child born prematurely at 8 months, no spinal disease or deformity present.

In this case I attach much more importance to the fact that the child can talk and recognise the parents than to the lateness in developing control of the muscles. Therefore, judging from the bright appearance of the child, I think that the lateness in sitting up and walking is due to what can best be defined as backwardness, and my prognosis of both the mental and physical development is good.

A. C., *æt.* 2 years. Brought because she cannot walk or talk and seems very irritable. She has attacks of unconsciousness, sometimes every half hour, sometimes once a day. She bites and eats anything that she can get hold of, taking pieces out of her clothes or out of the table-cloth. There is no family history of mental affections ; the mother is nervous and she had a bad shock during pregnancy.

On examination the most marked symptom exhibited by the child is the great want of the power of attention, for, though the child can be shown to hear and see quite well, she does not notice loud sounds or bright objects unless they happen to catch her wandering attention, but gazes aimlessly around with a vacant stare, continually moving her head from side to side. She cannot walk or talk and has made no attempt at either. There is no

sign of any control over the sphincters. She resents any examination of her head, which is  $18\frac{1}{2}$  inches in circumference. Epicanthic folds are present, but the palate is normal.

In this case, in spite of the facts that there is no family history (no importance is to be attached to the history of shock during pregnancy), that there are but few physical stigmata, and that the patient has a fair-sized head, it is easy to diagnose mental deficiency from the vacant expression due to want of attention (since it can be shown that sight and hearing are both developed), the lateness in learning to walk and talk and to control the sphincters, the irritability, and the habit of eating anything. The prognosis in this case is decidedly bad.

As the child gets older the diagnosis becomes increasingly easy, for now other tests are applicable, and the difference between the intellect of the child under observation and that of a normal child is much more obvious, receives greater attention and causes much anxiety.

Still, up to the ages of 5, 6, and 7 years there are quite a number of cases in which the diagnosis of real and permanent mental deficiency is not at all easy. The points that help us at this period of childhood are the development of the powers of walking and of talking, the amount of control over the sphincters, and the general mental capacity as judged from the actions, the speech and language, the expression, the powers of memory, attention, imitation, and will, the presence of perverted instincts and habits, such as unusual wantonness and violence, an insatiable appetite, or the eating of clay or dirt. At a still later age we have again better indications of the mental power in the amount of response to skilled tuition, and we can test the mental powers much more readily now that the child has reached an age when those of normal mental capacity can read, write, and do simple sums, for it is in these abstract ideas that the weak mental powers of the slighter cases are made evident.

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## THE MEDICAL INSPECTION AND TREATMENT OF SCHOOL CHILDREN.

By CLEMENT DUKES, M.D., B.S., F.R.C.P., J.P., V.D.,

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THE medical inspection of children at school is a question of prime importance to the nation. For, if it be efficiently carried out, not only will the children of the present generation reap the benefit of a happier childhood, but, as adults, they will be better fitted for their work in the world. While, if it be inefficiently performed, it is sheer waste of public money, which, in these times of heavy taxation, requires some fortitude to bear with equanimity. It can only be consummated with proficiency if the working scheme be well organised. This cannot be achieved without considerable expense, which can be faced if "value received" is obtained from the necessary expenditure. There is nothing so expensive as inefficiency.

On November 21st, 1894, I read a paper on "The Inspection of Schools from the Medical and Sanitary Point of View," before the Ancient and Honourable Corporation of the College of Preceptors, while the Royal Commission on Secondary Education was sitting.

It was only in August 1907 that the Act was passed sanctioning this procedure for the children attending both Primary and Secondary Schools.

In the Education Act of 1902, which came into force on May 1st, 1904, the county was made the unit of area, and a county council the education authority for each area, under the guidance and control of His Majesty's Board of Education. The education of the present generation is no sinecure. Demands are made upon teacher and taught that were not even dreamed of a generation ago.

During the early years of compulsory education, so long as the child spent some time within the walls of a school, nothing further was required. Then followed "payments by results," which had such disastrous effects, and so on, we progressed, step by step, until we have arrived at our present stage.

The Congress of School Hygiene, held in London in 1907,

when 1,650 members from every civilised country assembled, conspicuously proved the urgent desire of each nation to learn from others the various methods adopted for promoting children's welfare. Every member was eager so to order the scheme of education, that the *sound* child should not leave school in a weakened state of health produced by the system pursued; that the *delicate* child should, by well-devised methods, be invigorated by the conduct of his mental and physical education, under hygienic conditions; and that *crippled* children—whether the enfeeblement reside in intellect, in sight, in hearing, in speech, or in limbs—might find adequate provision made for these defects; or, where the infirmity was irremediable, that such children might be classified, and instructed in groups, not simply as an aid to their own advancement, but for the avoidance also of the torture of pressing those whose mental or physical state was below the average, by attempting to educate them concurrently with their more favoured school-fellows.

Seeing that each county council has this herculean task and responsibility on its shoulders, it was imperative that one burden more should be added in order to lighten its weight of responsibility, for without this additional duty the task would be incomplete, and indeed impossible.

The county council is answerable for the medical inspection of the school premises. It is incumbent on the council to see that the premises are adequate and appropriate for the purpose of mental education, and for physical training by means of games, exercises, or drill.

The medical examination of school children also appertains to this authority, and comprises the ascertainment of the nature of the education for which each child is fit; the classification of the scholars for this purpose; the detection of disease, defect and deformity; and the prevention of illness occurring during, or incidental to, school life.

The question naturally follows: Who should be the officer to undertake the medical examination of school-children?

The time has arrived when every county council should institute a county medical officer of health, with security of tenure, at the head of the health department of the county council, who should possess complete control of all that

relates to the health of the county, and who should advise, and be solely responsible to, the county council for the whole of the work of the health department of the county. To one of the sections of this department should be assigned the "Medical Inspection of Schools," and the "Medical Examination of the School Children." This would require the appointment by the county council of a special medical officer of schools, with the sanction of the Board of Education, in order to secure an efficient appointment, and with the concurrence of the county medical officer of health with whom he would be associated in work.

The special officer here suggested should devote his entire time to the duties, and thus be enabled to undertake the supervision of the children in the whole of the schools of the county, and in some few cases the charge of even a larger area. This course obviously involves the appointment of local medical men as assistants to the Medical Officer of Schools for smaller areas which require to be carefully and systematically mapped out, commensurate with the schools in the districts. In this way only can a county council assume adequate and relevant control, and reasonably be responsible for the health and education of the children within the county area. Some of the ablest local assistants in noting delicate or ailing children are the teachers themselves; their sympathy and help should, by tact, be courted in every possible way. The Medical Officer of Schools would organise, and participate in the work, and analyse the reports of all local assistants. In this well-organised regiment of workers in the health department of the county council, the County Medical Officer of Health would be the Colonel; the Medical Officer of Schools, the Major; the local medical assistants, the Captains; the teachers, the Lieutenants.

Where a county council has not a County Medical Officer of Health, it should appoint a Medical Officer of Schools, whose office should be a branch of the health department of the county council, and to that council he should be solely responsible. The inspection of schools, and the medical examination of school children, should comprise all the primary and secondary schools within the county area. The annual report of the Medical Officer of Schools should be sent to



the County Medical Officer of Health, as a branch report, and through him be presented to the county council. This report should include, not only the health and physique of the children, but the state of the school-buildings and their general sanitary surroundings.

In carrying out the medical inspection of schools and scholars it is essential to secure the harmonious co-operation of all school authorities,—especially the teacher ; to safeguard the rights of the local medical practitioners ; not to infringe upon the *amour propre* of parents ; and above all to ensure the separation of the functions of medical examination, and of treatment if undertaken.

The Act of Parliament was framed for the medical examination of school children, and did not enact their medical treatment. To many the one has appeared futile without the other. The Scandinavian countries, who were in the van in the medical examination of school children, did not pursue the course of subsequent medical treatment. The nation should not be called upon to undertake the arduous duty of putting into practice the suggestions made by the medical examiner. If this be done, many parents will only be rendered more helpless and heartless ; this abstraction of their natural duties can only result in a further deterioration of parental character ; and neighbouring medical practitioners would be deprived of a large portion of their living.

Many of the parents of these school children are quite able to pay for the services of their own medical advisers to carry out the necessary medical treatment of their children. In instances where such is not the case, if the State is to undertake the treatment of the remainder, adequate remuneration should be made by the State to local medical practitioners (or to provident dispensaries), who, in cases of difficulty, should be able to seek the services of local colleagues, or those of local hospitals on presenting their cards, and to resume charge on such cases leaving hospital. To attempt to make indiscriminate use of hospitals, which are charitable institutions, with or without payment, as a State Medical Service, is incompatible with expediency in the public interest, or justice, either to the hospitals concerned, or to the gratuitous services of the honorary staff. Such a scheme should be resisted by the whole weight of our much-abused profession.

## USE OF THORIUM AND RADIUM IN SOME DISEASES OF THE PHARYNX AND LARYNX.

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THE use of thorium emanations for the treatment of pharyngeal and laryngeal disease was suggested to me by Mr. Mackenzie Davidson in 1904, and Professor Soddy kindly gave me information as to the best form of inhaler to use for the emanations. I generally use that made by Armbrecht, Nelson & Co., which is a very good inhaler, but it is rather expensive, and a two-way flask, the rubber tubes clamped with ordinary metal clips when the apparatus is not in use will do almost as well, and is about half the price. At first I interposed a U tube in which were some pieces of caustic potash, to neutralise any acid fumes from the thorium nitrate, but I now depend upon careful neutralisation of the original solution, and only put a little cotton wool (to absorb moisture) into the U tube, as I found on one or two occasions that patients let the caustic potash melt, and then sucked it into their mouths, with, of course, unpleasant results.

The thorium nitrate should be made of the strength of about 3—4 ozs. of the nitrate to 17 ozs. of water, and this should be neutralised with ammonia added drop by drop, stirring all the time, till the hydroxide just gives a faint permanent precipitate. The neutralisation takes some time, and should be carefully done. I believe that neutral thorium nitrate can be got, but that it is very expensive. The air space above the solution in the inhaler should be small, as it is advisable to collect the emanations in as small a space as possible. "The emanation, though infinitesimal in quantity, is considerably more active than the substance itself, and, being a gas, can readily be drawn away or otherwise expelled from the pores or neighbourhood of the salt. But it accumulates again, being evidently generated *in situ*, and presently the full activity of the substance is regained."<sup>1</sup> As the life constant of thorium is  $24 \times 10^9$  years, and as thorium is perpetually giving off emanations which, by changing into thorium A and

<sup>1</sup> Sir Oliver Lodge Electrons.

thorium B, finally give off  $\alpha$ ,  $\beta$ , and  $\gamma$  rays, we have, in a given quantity of thorium, a supply of emanations which will last at least as long as will the average doctor or patient.

The method of use is for the patient to take a long breath through the mouthpiece, then hold his breath while he counts twelve slowly, and then breathe out again. A minute should then elapse for the emanations to collect again before the next inhalation is made. As a rule, patients inhale for thirty minutes twice daily, but I have found good results from inhalations for fifteen minutes twice daily.

I have now used thorium in about thirty cases of throat complaints. Many of the patients were suffering from pulmonary phthisis, and the throat condition was secondary to that of the lungs, some have been cases of ordinary chronic or acute pharyngitis and laryngitis. In a few cases of tubercular ulceration of the larynx I used radium.

*Results.*—I never found that thorium had any effect upon the lung condition in cases of phthisis. Many patients improved greatly so far as their chests were concerned, but, as they were under strict sanatorium treatment, it is probable that the pulmonary disease would have improved any way, and that the thorium had nothing to do with the amelioration. In most of the tubercular cases treated thorium was only used when the local throat condition did not seem to be benefiting under ordinary open-air treatment, and, therefore, when decided improvement in the throat was noticed after inhalations had been begun, the thorium may be given the credit safely. In some cases, though the lung condition got steadily worse, the throat either remained as it was or got better appreciably. In other cases thorium has not appeared to do any good, but, as a rule, in these cases the chest also did not get any better and the patients got rapidly worse.

I give below some of the cases treated:—

Case I.—Miss W. In the Sanatorium for one year.

*Chest Condition.*—Cavitation and consolidation right lung.

*Throat.*—Redness of both cords, ulcer on right cord, interarytenoid swelling and granulation. Thorium for four months. The ulcer healed, the cords became normal, the interarytenoid swelling and granulation nearly disappeared. The patient herself got on very slowly, and was always cyanosed and dyspnoeic.



## Case II.—Mr. G.

*Chest.*—Right lung involved nearly all over ; no cavities.

*Throat.*—Cords both injected, edges rough, some interarytenoid swelling. Thorium for two months ; at the end of this time the throat was well, except for slight interarytenoid thickening, and irregularity.

Chest improved much ; at the end of six months there were only a few physical signs.

## Case III.—Miss G.

*Chest.*—Extensive disease of both lungs.

*Throat.*—A great deal of swelling of the false cords ; they met over the cords on phonation, slight arytenoid swelling, general redness of larynx, no ulceration.

Thorium for two months, at the end of which time the throat was quite well. Three months later she had a second attack of inflammation of the false cords. She was treated with inhalations of Tr. Benzoini Co., but as this did no good she was put on thorium, and in a fortnight the throat was quite well, and gave no further trouble, though her lungs did not improve, and she died soon after leaving the Sanatorium.

## Case IV.—Mr. M.

*Chest.*—Extensively diseased, improved greatly before leaving the Sanatorium.

*Throat.*—Ulcer on the right cord before coming to the Sanatorium, which healed up during his stay.

After leaving, he went for a sea voyage, and got an attack of pleurisy on board ship. He had to return to the Sanatorium. His lungs were worse than before ; he had acute laryngitis and complete loss of voice. Thorium for one month. The laryngitis was cured, but his lungs got rapidly worse, and he died shortly after his return from abroad.

## Case V.—Mr. C.

*Chest.*—Apex of right lung involved.

*Throat.*—Redness and thickening of false cords, some thickening of true cords, pharyngitis. Thorium for three months. The larynx improved very much. The pharyngitis was never cured, but this patient refused to rest his voice, and to deny himself peculiarly bad tobacco and perpetual smoking, notwithstanding which, his chest improved greatly.

From these cases it will be seen that the lung and throat

condition did not improve equally, and that, as stated above, thorium seemed to have little effect upon the lungs. In three or four cases of advanced disease of both lungs and throat thorium had no effect at all on the throat. In one case, where the whole larynx was involved, it appeared to do good for a time, but this may have been a mere chance improvement, as subsequently the throat became very much worse.

Ten cases of ordinary pharyngitis and seven of fairly acute laryngitis, seen in private practice, all cases where there was no phthisis, did very well on thorium.

In cases of very chronic pharyngitis the granulations were generally cauterised first, and the patient put upon thorium afterwards, but one case, that of a clergyman living in the country who had had chronic pharyngitis, the improvement from thorium alone was so great that, without any other treatment, he was able to get through a week of mission services without losing his voice, a thing he had seldom managed before. Whether everyone was as pleased with this result as he was I cannot say, but it seemed rather a triumph for thorium. Another patient living in the country had suffered for years from pharyngitis, and had an unusually large number of dilated veins in the pharynx. As she could not stay in town long enough to have the pharynx thoroughly treated she was supplied with a thorium inhaler, and I heard at the end of a month that her throat was so much improved that she hardly felt it all uncomfortable.

A patient living in the country who had phthisis got an attack of acute laryngitis, for which she used thorium for three weeks, resting her voice more or less at the same time. She was completely cured so far as her throat went. I regarded this as a case of ordinary laryngitis, probably not tubercular.

*Radium*.—I have only used radium in four cases. Messrs. Armbricht, Nelson & Co. made me a ball containing  $2\frac{1}{2}$  milligrammes of radium bromide melted in celloidin and fused on to the end of a malleable laryngeal rod. The ball was coated with collodion, and could be cleaned with a solution of hyd. perchlor. I used radium only for cases of single ulcers of the cords or interarytenoid space, where there was no swelling of the epiglottis, and not much of the arytenoids. The radium was held about  $\frac{1}{8}$  of an inch from the ulcer for three or four

periods of half a minute daily. One case was a highly neurotic woman who gagged so badly that treatment was impossible. The second case was also a woman with advanced pulmonary disease, an interarytenoid ulcer, and a lump of granulations. So long as the radium treatment was kept up the ulcer got no worse, but her general condition became so bad that she could not tolerate the radium on account of dyspnœa. Directly I stopped the radium the ulceration increased rapidly, and before death the whole larynx was involved. A single ulcer on the left cord in a woman patient seemed to get better for some time, then no improvement ensued, and I tried lactic acid, with the happy result of curing the ulcer. A man who was under treatment in the Sanatorium for his lungs had a single ulcer on the left cord which seemed to benefit rapidly from radium, but he had to leave the Sanatorium before either his lungs or throat were well.

I cannot say, therefore, that my experience of treatment with radium is either extensive or encouraging. In all but one of these cases I worked under the disadvantage of being able to apply the treatment myself only once a week, and having to leave the daily treatment to others. Thorium has the advantage that patients can learn easily to use the inhaler for themselves.

In the case of laryngitis, either chronic or acute, occurring during the course of tubercular disease of the lungs, thorium appears to be a useful remedy, and it can be used with great advantage in non-tubercular pharyngitis or laryngitis. The solution lasts for a lifetime. Patients can use the inhaler for themselves, and even if it does no good, apparently it can do no harm, which is more than can be said for all remedies which patients use for themselves for indefinite times.

Most of the tubercular cases cited above were under treatment in the East Anglian Sanatorium, and I have to thank Dr. Jane Walker for her kindness in permitting me to publish these results.

Further details as to the methods of preparing and using thorium can be found in papers by Professor Soddy and Dr. Sharp in the *British Medical Journal* of July 1903 and March 1904.



## THE PROPHYLAXIS OF APHASIA.

BY FREDERIC C. COLEY, M.D.,

*Physician to the Northern Counties Hospital for Diseases of the Chest ;  
Consulting Physician to the Hospital for Sick Children,  
Newcastle-upon-Tyne.*

PROBABLY few of us have ever attempted to realise the horror of hemiplegia with aphasia. Try to imagine for a few moments (it would not be a pleasant subject to allow the mind to dwell on long) the life of a patient in that condition: helpless by reason of the paralysis, and unable to tell his wants or to ask for the means of relief from pain, on account of the aphasia. Left-sided hemiplegia is a calamity quite serious enough; but the absence of aphasia is such a mitigation as to make the difference between right and left hemiplegia enormous in respect to the amount of suffering involved.

In view of this I would suggest that provision should be made against aphasia in cases where, from the presence of granular kidney or other indications, there is reason to expect hemiplegia. No doubt in many, perhaps in most, cases it would be neither kind nor wise to inform a patient that he was in danger of such a calamity. But sometimes he may be quite aware of its possibility, as in the case of one now under my own observation, whose father had right-sided hemiplegia with aphasia. In such circumstances no harm, and probably a very great deal of good, might come from instructing the patient how to provide against the contingency of a lesion involving the left Broca's convolution.

Of course I am not now considering the ordinary hygienic precautions intended to make cerebral hæmorrhage less likely to occur. But, without belittling the value of such precautions, I would ask whether nothing can be done to mitigate the calamity in case they should fail.

My suggestion is, that a graphic centre should be made to

develop in the right side of the brain by practising writing with the left hand. To secure the end in view, it is not sufficient to be able to write legibly with the left hand, each letter being formed by a distinct and sustained effort, the will consciously guiding every movement of the pen or pencil. The required development of the right graphic centre is not attained until by practice the movements of the left hand in writing have become instinctive, as those of the right hand are.

When this is the case, there is good reason to believe that no lesion of the left side of the brain would deprive the patient of the power to write. And it is far from impossible that the power of speech would also be retained, because of the close functional connection between the speech centre and the graphic centre. But if only the faculty of writing were preserved, the importance of that to the patient would be immeasurable.

Any normal person can write, with a considerable effort, with the left hand, the first time that he tries. All he needs is sufficient practice to turn this laboured performance into an action which practice has made instinctive. But the subject of aphasia and agraphia cannot write at all. If he is taught to write with his left hand, he must be taught just as a child is. Only in a very few cases has this been found practicable. And in the meanwhile, until this peculiarly slow and difficult process of education has been accomplished, the patient's communications with his fellow creatures are cut off.

Education of a graphic centre in the right side of the brain, as a prophylactic measure, is a very different matter from the same thing as a method of treatment commenced after hemiplegia has occurred.

It is to be regretted that in many cases it would be impossible to induce the patient to take the necessary trouble without a full explanation of the reasons for recommending it. And that would rarely be possible without producing much more alarm than we should wish. But a patient who was in any degree aware of the possibility of becoming the subject of hemiplegia with aphasia, would be to some extent relieved to discover a means of securing himself from the danger of

being deprived of the power of communicating his wants at the same time that his helplessness made him unable to supply them for himself.

A medical man, for instance, who knew himself to be suffering from granular kidney would do well to practise writing with his left hand until he could do it as easily as with the right.

The required process of self-education need not make very serious demands upon the time of a busy man. Until the performances of his left hand become tolerably good, he may use it for making memoranda, first drafts of letters or literary matter, and other writings which are intended only for his own perusal. Before long, if he perseveres, the work of his left hand will become good enough for less restricted use. After that improvement should be more rapid.

In any instance in which this method is fairly carried out, and in which right hemiplegia happens afterwards to occur, it would be very interesting to note if aphasia, as well as agraphia, would be prevented, as I have ventured to predict. \*





## ADVENTURES WITH A CURETTE.

BY ROBERT WATSON, M.D.

THE curette is peculiarly an instrument which the general practitioner is warned to leave alone. His text-books as a student (mine anyhow) gave him no encouragement to meddle with it. Professors mentioned it with reserve, and hospital procedure emphasised the prohibition. Yet it appears to me that only benefit could result were this sinister instrument more often in the hands of the general practitioner.

When I contemplate the pre-curette days of my own career, I am profoundly moved for the unhappy enthusiast I see there, patiently and *secundem artem* working absorbent wool and tape into a kite's tail doomed to fly no further than the nearest abortion, patiently and perspiringly endeavouring to persuade a coy ovum to come within the crook of an aching index finger, patiently and unavailingly administering drugs of reputed emmenagogue action to all sorts and conditions of fiercely-flooding women.

The futility of the means, the waste of energy, the expenditure of valuable time—to say nothing of the loss of blood and risk to human life entailed—thoughts of these madden me when I consider the efficiency and expedition of the man who uses a curette. Mine was purchased in 1903, a Gervis', which cost me 8s. 6d. I want, briefly and lightly, to review the types of adventure into which it has accompanied me. Because it was bought as the result of a growing conviction that there must be some method more expeditious than digital evacuation for completing early abortions, I naturally turn first to that aspect of practice.

In the years 1903 to 1908 inclusive, I attended, of abortions varying from 6 weeks to 4 months, 60 cases. A considerable time before I had in such cases abandoned as ridiculous, unscientific, and seldom effective the practice of plugging the vagina. The administration of ergot, close supervision, and

digital evacuation appeared to me the best means within my reach. How poor that best was is known to every practitioner who has trodden the same road and watched how rapidly good blood can flow through an os which seems intent on refusing exit and admittance to everything else. Even where the index finger can pass within the os, there are trying occasions when hours are spent in strenuous endeavour before the whole ovum with the incipient placenta comes clean from the uterine wall.

With all a general practitioner's respect for the powers that be, and an exceptional aversion to meddle with forbidden tools, I yet felt that overmuch of a man's life might be wasted (one selfishly writes it thus, where the actual cost may prove all of some unhappy woman's life) for want of initiative and a decent restraint upon one's organ of veneration. So I bought the curette.

I had before this acquired an ovum-forceps, which, be it confessed, never honestly fulfilled a solitary hope or justified its presence in my outfit. The name is suggestive—even grateful and comforting—but the ovum and the forceps never betrayed the affinity that the hyphen led one to expect. The curette was different. There was no glamour about the name—quite the reverse—but the instrument worked. Tentatively, I began to use it to persuade reluctant pieces of retained placental tissue to come away. This yielded me on the very first and every occasion the invaluable, inexpressible sensation that comes when your curette, having scraped through other substance, grits crisply upon healthy uterine wall, a sensation which forms the goal and limit of one's aspiration in operating.

With familiarity arrived a readiness to utilise the curette earlier and still earlier in abortion until the chariest os was prodigal enough if it but opened sufficiently to admit the smaller end of the Gervis'.

That introduced, there was no excuse for delay. The ovum could be detached by methodically working the instrument around the uterine cavity, hæmorrhage was speedily reduced to a negligible quantity, and, sooner or later, expulsive action became vigorous enough to complete the incident. Even when you did not wait for that desirable consummation, you

departed with the knowledge that your interference had placed the patient much more favourably than the classical kite-tail packing could have done. You went about your other business with no uneasy sense of impending calamity, no burden of deferred work.

Of twelve abortions in 1903, I curetted three. I did four out of nine in 1904. Next year, seven out of eleven; and so on. Of sixty cases in all, thirty-three were curetted. None gave me any anxiety through rise of temperature or signs of septic absorption. There was an occasional case where the discharge became offensive and shreds appeared in it over a period of a few days. All made good recoveries. I cannot say that those did better in which instrumental interference took the place of digital evacuation; on the other hand, I know they did no worse.

That is the whole point. I do not claim that a curette is superior to one's index finger—of the two, with a wide os, the latter is greatly to be preferred—but time waits for no general practitioner, and while he sedulously endeavours to manipulate a procrastinating abortion his day's work suffers and patients he has acquired through infinite cultivation slip east and west into other hands.

The curette can be insinuated with but little difficulty into almost any aborting uterus. Add to your curette a sound, a vulsellum, and a cervical dilator, and no os can long deny you admission; but, for myself, I have rarely resorted to these. All that a small os means more than a wide one is that, your curettage accomplished, you leave the patient without seeing the uterus emptied.

At sight this seems a tremendous omission. It would appear to place your professional reputation upon the lap of the gods—a place where no self-respecting physician leaves anything of value—but the risk incurred is more imaginary than real. I reckon, of course, upon every operation being carried out with a decent regard for modern ideas of scientific cleanliness. That assured, I cannot see—and experience has not led me to expect—that an ovum shredded and separated from the uterine wall, whose expulsion may confidently be anticipated within a matter of hours, constitutes anything like so sinister a



menace to health as the adherent slowly-disintegrating, steadily-decomposing abortion whose offensive exit, sanctioned by many text-books and viewed with composure by a section of our elderly brethren, has always seemed to me barbarous and fraught with incalculable risk.

That there is nothing original in this use of the curette I am aware. Hints, here and there, in text-books tell me the performance is familiar to specialists. I contend it should be equally familiar to the general practitioner.

My whole argument is that the curette is not an instrument only for high days and notable occasions, consecrate to gynæcologists and specialist obstetricians, but for all seasons and for the rank and file of the profession. I wish to aid in the banishment of the superstitious veneration in which this instrument is held and persuade my brothers in the ranks that

" . . . . . there's the respect  
That makes calamity of such long life."  
For who would bear the reckless waste of time,  
A stubborn os, good blood's persistent ebb,  
Laymen's impatience, and the spurns  
Cautious physicians of the unworthy take,  
When he might swiftly a safe end attain  
By bold curetting?

There are other adventures. A particularly disconcerting type of patient for your general practitioner is the otherwise healthy dame whose climacteric evolution is characterised by fierce metrorrhagia. Treated on the old-fashioned physicianly lines, she is ordered to bed, restricted to cold rations, dosed with ergot, strychnine, iron, and the like; a scholarly touch may be given by the administration of calcium chloride or lactate and the elevation of the foot of her bedstead; yet she is inconsiderate enough to continue bleeding until a specialist arrives and inaugurates another plan of campaign. By this time she is assured, at the mildest estimate, of an obstinate debility, and the onset of her next period is expected with anxiety by both herself and her physician. Had the latter but used, confidently and early, a curette to the endometrium, the aspect of this transaction would have been more comfortable for all concerned. Instead of waste, economy in blood, time,

money, mental distress—all saved by a brisk curettage undertaken as soon as the futility of mild measures becomes apparent. The risk is inconsiderable; more danger lurks in an obstinate faith in pharmacology.

I have curetted quite a number of these cases, always with satisfactory results. Often one scraping sufficed. Occasionally, after the lapse of months, a second, even a third, became necessary.

Apart from that, these cases have furnished few incidents of note. Once the curettage of such a case brought away a very perfect membranous cast of the uterine cavity. In another case the temperature rose high about the seventh day, and a boggy condition of the left wall of the vagina made me apprehensive of pelvic cellulitis. A specialist called in in consultation considered an operation advisable. The patient was chloroformed next morning, when already the boggiess had much diminished, and a little circumscribed abscess, beginning to point, was laid open, the covering clipped away, and its cavity packed. Curetting my patient at the same time, the specialist was able to dispel any lingering suspicion that my operation had contributed to the septic mischief.

There is no need, perhaps, to write more. The general practitioner who adventures thus far with a curette will find himself, however, the master of an art which on many another less urgent occasion can serve him right well.



## A REVIEW OF RECENT OPHTHALMIC LITERATURE.

By L. VERNON CARGILL, F.R.C.S.,

*Surgeon to the Royal Eye Hospital; Ophthalmic Surgeon to King's College  
and the Seamen's Hospitals.*THE RELATIVE VALUE OF THE CHIEF SILVER COMPOUNDS  
IN CONJUNCTIVITIS.

It has been stated that the bactericidal power, and therefore the clinical value, of a silver compound depends upon the amount of the contained silver. The percentages of silver in the three silver compounds, chiefly used in ophthalmic practice, have been estimated as follows:—Nitrate of silver 63·6 per cent. (Marshall and Neave) to 66·6 per cent. (Kelly); argyrol 17·03 per cent. to 20 per cent.; and protargol 7·03 per cent. to 7·4 per cent. Thus we see that nitrate of silver contains 9 times as much silver as protargol, and 4 times as much silver as argyrol.

Now the bactericidal action of these three silver compounds, as tested on a filtered and diluted emulsion of a 3 days' agar growth of *staphylococcus pyogenes aureus*, was determined by Kelly to be in the following proportion, viz.:—Nitrate of silver in ·0039 per cent. solution killed in 5 minutes; protargol in 1 per cent. solution killed in 5 minutes; whilst in the case of argyrol in 50 per cent. solution, acting for 12 hours, a growth was always obtained on the first day, but not after 24 hours' exposure. The solution of protargol had then to be about 256 times as strong as the silver nitrate solution in order to produce the same effect, hence it is obvious that the amount of contained silver is no proof of bactericidal power.

The explanation suggested by Burdon Cooper of the higher bactericidal power of silver nitrate is the property the metallic salts possess of becoming electrically dissociated. This dissociation is specially marked in the case of the inorganic salts of silver, such as the nitrate, which are capable of reacting with sodium chloride.



Protargol also contains ionised silver, and is capable of giving a reaction with sodium chloride, and to this fact must, according to this theory, be attributed its bactericidal power ; whilst argyrol contains no free silver ions, and possesses therefore little or no bactericidal power. In combined bactericidal and penetrating power silver nitrate has been estimated as 40 times stronger than protargol.

In regard to disadvantages, argyrosis can be caused by all three ; and the discomfort caused by 20 per cent. protargol lasts rather longer than that caused by 0·5 per cent. nitrate of silver ; whilst argyrol 20 per cent. is quite painless and even soothing. Stronger solutions of silver nitrate cause considerable discomfort, but Harman notes that the addition of 15 per cent. glycerine to a silver nitrate solution makes the application not only less painful but also more effective.

To sum up, we may conclude that, for bactericidal effect, nitrate of silver ( $\frac{1}{2}$  per cent. to 2 per cent. solution) is still the best of the silver compounds in the ophthalmic surgeon's hands ; whilst protargol (5 per cent. to 20 per cent.) is specially serviceable for home treatment. On the other hand, argyrol (20 per cent. to 30 per cent.) is a useful and mild astringent and sedative. In angular or Morax-Axenfeld conjunctivitis, silver salts are useless, while sulphate of zinc is a specific, although in obstinate cases a strength of 8 to 10 grains to the ounce may be necessary.

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#### OPHTHALMIC COMPLICATIONS OF NASAL DISEASE.

The laborious and brilliant anatomical researches of Onodi, demonstrating so fully the intimate but varying relationships between the accessory nasal sinuses, on the one hand, and the orbits and optic canals, on the other, has naturally attracted closer attention to the possible and probable ophthalmic complications and sequelæ of nasal disease. The additional and clearer clinical knowledge, which has thus been built up by keen observers, has provided the ophthalmic surgeon with further and more definite clues as to the causes of some

otherwise occasionally unaccountable ocular conditions.

A careful examination of the nasal passages is now indicated in all instances of obscure and persistent headache and neuralgia, where refraction error and muscular unbalance have been eliminated, and in cases of inexplicable visual disturbances, weak accommodation, and sluggish pupils (ophthalmoplegia partialis interna); also in unaccountable papillitis, retrobulbar neuritis, optic nerve atrophy, thrombosis of the ophthalmic vein, and retinitis; and in all cases of slight orbital œdema, orbital cellulitis, and thrombosis of the cavernous sinus without an evident aural cause. So far as pain is concerned in nasal suppuration, although very variable, it is usually situated at the root of the nose, and in the frontal region; it may become more intense on bending forward, and is usually worse in the morning. In antral disease pain may be localised in the antrum and accompanied by infra-orbital neuralgia. In sphenoidal disease the typical pain is at the back of the eyes, but it may be occipital. If retrobulbar neuritis is of nasal origin there is usually pain, as if the eyeballs were being pushed backwards, whereas in toxic retrobulbar neuritis there is no pain.

The causes of orbital cellulitis (apart from septic penetrating wounds, foreign bodies, and orbital fractures) include infection from the skin, as in erysipelas, and metastatic infection, as in pyæmia. Periostitis of the orbital walls and purulent thrombosis of the cavernous sinus are also possible causes; but we must agree with StClair Thomson in regarding cellulitis of the orbit as generally the result of disease in one or more of the accessory nasal sinuses. In other words, inflammatory diseases of the orbit are nearly always caused by nasal disease, the development of orbital cellulitis being usually preceded by nasal suppuration and necrosis of the orbital bones. Hence, in every case of orbital cellulitis it is imperative that a careful examination should be made of the nasal fossæ.

In this connection it must not be forgotten that the orbital complications may be the first evidence of nasal trouble; and, further, that there may not only be no history of nasal discharge, but that it may be entirely absent. One of Thomson's cases only admitted the annoyance of slight, long-standing, post-nasal discharge, after careful questioning, and yet there was suppuration in every accessory nasal cavity.

Not only may orbital cellulitis be the initial evidence of

nasal disease, but the more serious condition of thrombosis of the cavernous sinus may be the earliest indication, and 17 cases have been collected by Thomson, in which sphenoidal sinus suppuration was proved, post mortem, to have been the direct origin of cavernous sinus thrombosis.

The distinctive features of the latter, it should be remembered, are severe constitutional disturbance with cerebral symptoms and intense headache, œdema behind the ear, and a tendency to extension to the opposite side.

So far as treatment is concerned, the reviewer has seen very early cases of orbital inflammation secondary to nasal disease subside with such simple measures as menthol and eucalyptus inhalation and local fomentations; but, where there is intra-nasal obstruction, this, of course, must be dealt with. Recent orbital suppuration may only need evacuation; but the detection and treatment, at the same time, of sinus empyema is, of course, most important.

In cases of thrombosis of the cavernous sinus the discovery and prompt treatment of sphenoidal or aural suppuration is of vital moment.

Axenfeld rightly lays stress on the importance of an exact rhinological examination, and, in regard to the share that the ophthalmic surgeon should take in the treatment of these cases, he says that, if the rhinologist is of opinion that the necessary endo-nasal treatment will remove the orbital symptoms, the case should be left to him, as, of course, should all purely endo-nasal treatment.

In cases, however, where the orbital inflammation is sufficiently severe to demand incision into the orbit, the diseased sinus nearly always requires radical operation as well. The affected sinus being in these cases determined, it should be opened at the same time as the orbit by the ophthalmic surgeon, who should also be prepared to deal with any causative sinusitis which is only discovered during the operation on the orbit either by the probe, or by the escape of irrigating fluid from the orbit *via* the nostril.

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#### THE OPHTHALMO-REACTION AND ITS DANGERS.

In May, 1907, Von Pirquet called attention to a new clinical test for tuberculosis which has received the name of the Cuti- or Cuto-reaction. A suitable area of skin being cleansed with ether, vaccination with a drop of 25 per cent. old tuberculin in 0.5 per cent. carbolic acid is performed with a sterilised lancet. The positive reaction consists in the development of a papule, generally within 24 hours and lasting five or six days. Wolff-Eisner showed that a reaction could be obtained by applying a 10 per cent. solution to the conjunctiva; and Calmette suggested the systematic application of the test to the conjunctiva, and, in order to eliminate the irritant effect of the glycerine, precipitated the tuberculin in 95 per cent. alcohol and dissolved the dried precipitate in sterilised water or normal saline. A single drop of a 0.5 per cent. or 1 per cent. solution, instilled into one eye, produces, as a typical reaction, an injection and swelling of the caruncle in three to six hours, which goes on to a mild conjunctivitis with muco-fibrinous secretion, but without pain or pyrexia; and the reaction passes off in two or three days.

This test, which became known as the "ophthalmo-reaction," being so easily applied, was very soon largely and promiscuously practised, and it was not very long before cases were recorded of excessive, alarming, long continued, or relapsing inflammatory reaction, not only in the eye tested, but even in the fellow; whilst in some instances permanent damage followed from corneal inflammation and ulceration leading to subsequent opacity. Careless application was in some of the cases the cause of trouble, and it became recognised that the following conditions should obtain in the application of the test:—(1) the solution should not be stronger than 0.5 per cent.; (2) it should be freshly prepared and absolutely free from cloudiness and flakes; (3) it should never be used on an eye showing the slightest inflammation; and (4) both eyes should be normal, and free from the results of past disease.

In spite of greater care bad effects still resulted, and these precautionary conditions naturally precluded the test being applied in ophthalmic cases. Amongst other disadvantages it has been pointed out that even where there is no apparent ophthalmo-reaction, the subsequent therapeutic subcutaneous injection of tuberculin has brought on a severe reaction in the eye to which the test had been previously applied, the conjunctiva reacting exactly as a latent tuberculous focus would.

It has also been noted that the ophthalmo-reaction is likely to be more severe if the eyes are used immediately afterwards for reading or writing by artificial light.

Whilst neither the ophthalmo-reaction nor the cuti-reaction is absolutely infallible, it is generally held that a positive reaction is strongly presumptive of tuberculosis, whilst a negative result is rather less presumptive of freedom from tuberculosis. The exact relationship between the two methods is still undetermined, but Bing considers that the cuti-reaction reveals every tuberculous focus in the body, whilst the ophthalmo-reaction only shows those which are active, the reaction being proportional to the activity of the disease.

In very advanced cases of tuberculosis there may be no reaction with either test.

In order to avoid risks to eyesight the cuti-reaction must be chosen for ophthalmic cases if the conditions, already mentioned, are to be observed. If, however, there is any risk of permanent damage to even one of two good eyes, no really conscientious practitioner would employ the ophthalmo-reaction in any case, and great blame must attach to him who, in the face of the numerous warnings which have been published, is the cause of permanent ocular damage.

The cuti-reaction takes but little more time in application, it seems to be equally sensitive, and it is apparently harmless ; and it should therefore supplant the ophthalmo-reaction in medical practice.

It was contended by Detre, at the Washington Congress on Tuberculosis, 1908, that by using a filtrate of bovine bacilli on one arm and of human bacilli on the other, it was possible by the reaction obtained to determine from which form of

infection the patient was suffering.

This is a further advantage of the cuti-reaction, and, in this connection, it should be pointed out that, in some tuberculous cases, better results have been obtained by the use of mixed human and bovine T.R. than with human T.R. alone; and R. W. Allen's experience of this former method of treatment in ocular tuberculosis (cornea, iris and choroid) has been uniformly favourable, a cure being obtained in from four to six months instead of in from six to nine months by the latter method.

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### COLOUR VISION.

Edridge-Green's excellent work on colour vision is probably not so widely known and appreciated as its importance demands. He has insistently pointed out that colour names must be used for testing colour blindness; and that matching tests, such as Holmgren's, are valueless, and, if used alone, the normal sighted will be rejected, whilst the dangerously colour blind will be passed.

He divides the colour blind into the following classes: the "Dichromic," who only see the red and violet of the spectrum; the "Trichromic," who also see green; the "Tetrachromic," who recognise red, yellow, green, and violet; the "Pentachromic," who appreciate blue as well; the "Hexachromic," or normal, who also recognise orange; and the "Heptachromic" who see indigo in addition. The classes



above the "Trichromic" can identify signal lights, and, not being dangerously colour blind, are fit for such occupations as those of seamen and railway men.

There are three chief tests for colour blindness: the lantern test, the spectrum test, and the classification test. The lantern test (for which Meyrowitz made a special lantern) is quite sufficient practically, but "one mistake in naming red, green, or white (yellow) should suffice for rejection" with this test. If a "Trichromic" is shown a yellow light after red, he will call it green; and, if shown yellow after green, he will call it red.

The spectrum test is the best for scientific accuracy. Ramsey has introduced an efficient and convenient instrument for clinical work, in which colour sense can be easily tested with pure spectral colours from a prism grating, either by naming or matching. Diaphragms are also provided for testing central colour vision, and the illumination can be regulated.

Tomlinson has devised an ingenious Nernst lamp "projection spectroscope," in which a spectrum 8 inches long is projected on a screen by means of a lantern.

A classification test has been arranged by Edridge-Green, in which the test colours are red, orange, blue-green, and violet, there being 180 confusion colours. This test in a pocket form is also useful for detecting central colour scotomata.

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## Practical Notes.

THE TREATMENT OF LYMPHADENOMA.—The treatment of lymphadenoma was recently brought before the notice of the students at St. Bartholomew's Hospital by Dr. W. P. Herringham, who, in the course of a clinical demonstration of a case of lymphadenoma in a man, spoke of the results of the treatment of the disease by arsenic combined with the use of the X-rays. The patient began taking arsenic and having exposures to X-rays about April 15th, and he was at that time extremely dyspnoëic, and suffering very much indeed. He fetched his breath with the greatest possible difficulty. A fortnight from that time he was quite comfortable. The arsenic had got up to 7m. three times a day of liquor arsenicalis, and he had had six to eight exposures to the X-rays. The X-ray exposure was given in regular doses, as there is in Sabouraud's unit an exact means of regulating the dose. Dr. Herringham was certain, from his experience of other cases, that the arsenic alone was not responsible for the diminution of the growths, and that the X-rays had had a great deal to do with it. He insisted that of all drugs for the treatment of lymphadenoma there was no doubt that arsenic was almost the only one which had any effect.

PLUGGING THE VAGINA.—Plugging the vagina in the treatment of antepartum hæmorrhage is a method that has recently received considerable attention in hospital teaching, and it is interesting to note how Dr. H. Russell Andrews a few weeks ago dealt with the subject when instructing his students at the London Hospital. Prefacing his remarks with the statement that plugging the vagina was sometimes performed in a manner which was only an absurd travesty of the method, he proceeded to describe how it was necessary that the plugging must be performed systematically in order to produce a satisfactory result. Sterile gauze was probably the best substance to use, but failing that pledgets of cotton wool or linen rags would do if they had been rendered sterile. A surprisingly large quantity would be wanted. The bladder should be emptied before the plugs were inserted. The

membranes should not be ruptured artificially, or there might be some danger of increased hæmorrhage before the plugging could have time to act. The perineum should be retracted by a Sims' speculum or by the accoucheur's left hand while his right hand introduces the plugs. All the fornices should be filled as tightly as possible one after the other, then the whole vagina filled until the plugging material projects at the vagina. The application of a tight binder and a tight strong T-bandage completes the plugging. The uterus should be then compressed over every part of its surface, so that the pressure is too great for more blood to escape into its cavity. When the plug, binder, and bandage are in position, and not till then, saline solution should be injected into the tissues. That must not be done until the bleeding had been stopped, otherwise it would only tend to increase the bleeding, and if the patient is receiving saline solution and losing blood she would not score by the exchange. The result of the plugging is in most cases to induce contractions of the uterus, but even if it does no more than stop the bleeding it would be well worth doing, because the patient would be tided over the next few hours during which, with the help of warmth, saline solution, etc., she would recover from her collapse and be in a condition in which any necessary assistance to delivery could be given with impunity. If uterine contractions are induced, the plug should of course be removed before it could possibly cause any obstruction to delivery. After removing the plug labour could as a rule be allowed to proceed naturally. The plug should not be allowed to remain *in situ* for more than 24 hours. When it is taken out it is usually found that the cervix has become dilated to a greater or less extent, when labour can be left to take its course without further interference, or may be assisted by forceps or version if indicated.

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TREATMENT OF FEMORAL THROMBOSIS.—The treatment of femoral thrombosis after abdominal operations is an important and interesting matter for all concerned in such cases, and Mr. Bidwell, in the course of his teaching in the wards of the West London Hospital, lately had occasion to refer to this matter. He was talking at the bedside of a patient whose abdomen had been opened on the right side of the middle



line, and whose appendix and right ovary had been removed ; subsequently femoral thrombosis in the left femoral vein developed. It was pointed out that one of the several theories advanced to explain the occurrence of thrombosis after abdominal operations was that the abdominal walls are injured by retractors, and that thrombosis forms in the deep epigastric veins. It would be easy to explain a thrombosis in the right deep epigastric vein spreading to the right femoral vein, but it was more difficult to explain it spreading into the left femoral vein. The reason given for the left femoral vein being affected more commonly than the right was that the pressure of the sigmoid in the left iliac fossa causes an obstruction to the flow of blood through the left external iliac vein and so produces diminished blood-flow, which favoured thrombosis. It was most probable, in the opinion of Mr. Bidwell, that an attack of thrombosis in a femoral vein was simply an evidence of the special liability of the blood to coagulate. It was not uncommon in cases of typhoid fever for femoral thrombosis to occur, and he said that most of the cases of femoral thrombosis with which he had to deal occurred in patients who were fed upon milk. The reason milk had a tendency to produce coagulation of the blood was that it contained a very large amount of calcium salts. The proportion of calcium salts in milk was 1 in 600, and excess of calcium salts in the blood favoured coagulation. So that if thrombosis occurred, he immediately cut off the milk. The patient was taking two pints of milk a day shortly before the thrombosis occurred, and she was also having eggs, which contained a quantity of calcium salts. Mr. Bidwell had removed the milk and eggs from the diet, and put her on sodium citrate. Other things which decreased the coagulability of the blood were alcohol, tobacco, and oxygen. Of course anything which increased the force of the circulation decreased the coagulability of the blood, and therefore such therapeutical agents as tonics—strychnine, etc.—were also indicated. Thrombosis when confined to the femoral vein was of no particular danger : the danger was that a thrombus might get into the pulmonary artery. But by discontinuing the milk, and endeavouring to reduce the coagulability of the blood, there was not much danger of the thrombus spreading.

## NOTES FROM FOREIGN JOURNALS.

## FOR MIGRAINE AND NEURALGIA.

Martinet publishes in the *Presse Médicale* several prescriptions, the main principle of all of which is the combination of antipyrine, pyramidon, aspirine, quinine, phenacetine, and the like, and from which good results are obtained. These three groups of substances, variously combined with each other, or with other analgesics, hypnotics, heart tonics, or eupeptics, provide numerous mixtures, the joint effect of which is for the most part anti-neuralgic.

This synergic association of three groups can be realised, for example, in the following :—

℞ Phenacetini,  
Quininæ Hydrochloridi - - - - - ana gr. iv.  
Phenazoni - - - - - - - - - gr. viij.

Misce. Fiat pulvis.

"To be given in a cachet."

Recommended in the low type of influenza. The analgesic action can be heightened by adding exalgine, the depressing effect of which can be counteracted by caffeine :—

℞ Caffeinæ,  
Exalgini - - - - - ana gr. iss.  
Phenacetini,  
Quininæ Hydrochloridi - - - - - ana gr. iv.  
Phenazoni - - - - - - - - - gr. viij.

Misce. Fiat pulvis.

"To be given in a cachet."

Useful in influenza with adynamic tendency. For the treatment of a simple neuralgia or a migraine the quinine may be omitted from the above prescriptions.

The next three prescriptions are extremely useful for migraine :—

℞ Caffeinæ - - - - - gr.  $\frac{3}{4}$ .  
Quininæ Hydrochloridi - - - - - gr. iss.  
Salipyrini - - - - - gr. viij.

Misce. Fiat pulvis.

"To be given in a cachet."

℞ Phenazoni - - - - - gr. xv.  
Caffeinæ - - - - - gr. iss  
Acidi Citrici - - - - - gr.  $\frac{3}{4}$ .

Misce. Fiat pulvis.

℞ Caffeinæ - - - - - gr.  $\frac{3}{4}$ .  
Phenacetini,  
Salipyrini - - - - - ana gr. vj.

Misce. Fiat pulvis.

"To be given in a cachet."

The addition of citric acid promotes tolerance in the stomach. Effer-

vescing mixtures can be obtained by adding to any of the above bicarbonate of soda and tartaric acid, *e.g.* :—

|                    |   |   |   |   |               |
|--------------------|---|---|---|---|---------------|
| ℞ Phenazoni        | - | - | - | - | gr. xv.       |
| Sodii Bicarbonatis | - | - | - | - | gr. lxxv.     |
| Acidi Tartarici    | - | - | - | - | gr. xxxviiij. |
| Acidi Citrici      | - | - | - | - | gr. xxx.      |

Misce. Fiat pulvis.

All these substances readily form other synergic combinations with morphine, the bromides, aconitine, etc.

Martinet gives the following, which is said to work wonders in neuralgia due to teeth :—

|                          |   |   |   |   |               |
|--------------------------|---|---|---|---|---------------|
| ℞ Morphinæ Hydrochloridi | - | - | - | - | gr. ½.        |
| Phenazoni,               |   |   |   |   |               |
| Potassi Bromidi          | - | - | - | - | ana gr. x.    |
| Acidi Citrici            | - | - | - | - | gr. xxx.      |
| Acidi Tartarici          | - | - | - | - | gr. xxxviiij. |
| Sodii Bicarbonatis       | - | - | - | - | gr. lxxv.     |
| Sacchari Lactis          | - | - | - | - | ℥i.           |

Misce. Fiat pulvis.

"For an effervescent draught."

If preferred, antipyrine may be replaced in all the above by pyramidon or salipyrine; phenacetine by lactophenine or citrophene; quinine by euquinine or aristochin, etc., etc.—(*Journal de Médecine et de Chirurgie pratiques.*)

#### THERAPEUTIC INDICATIONS FOR MENTHOL.

In *Il Policlinico* several indications for the use of menthol are given :—

1. For uncontrollable vomiting in cholera.

|                          |   |   |   |   |           |
|--------------------------|---|---|---|---|-----------|
| ℞ Mentholis              | - | - | - | - | gr. iv.   |
| Acidi Lactici            | - | - | - | - | ℥i.       |
| ¹ Spiritus Vini Gallici, |   |   |   |   |           |
| Aquæ Chloroformi         | - | - | - | - | ana ℥iss. |

Misce. Fiat mistura.

"One teaspoonful every quarter of an hour or every half hour."

2. In idiopathic asthma.

|                         |   |   |   |   |          |
|-------------------------|---|---|---|---|----------|
| ℞ Mentholis             | - | - | - | - | gr. xii. |
| Sodii Bromidi           | - | - | - | - | gr. xxx. |
| ¹ Spiritus Vini Gallici | - | - | - | - | ℥v.      |
| Aquæ Chloroformi        | - | - | - | - | ℥ij.     |

Misce. Fiat mistura.

"One teaspoonful to be taken every hour."

3. In emphysema and chronic bronchitis.

|                          |   |   |   |   |          |
|--------------------------|---|---|---|---|----------|
| ℞ Mentholis              | - | - | - | - | gr. iij. |
| Sodii Iodidi             | - | - | - | - | gr. xxx. |
| ¹ Spiritus Vini Gallici, |   |   |   |   |          |
| Misturæ Mucilaginosæ,    |   |   |   |   |          |
| Aquæ Chloroformi         | - | - | - | - | ana ℥i.  |

Misce. Fiat mistura.

"One teaspoonful to be taken every hour."

4. In acute dysentery.

¹ Rum or old Cognac.



One drachm of ipecacuanha powder is boiled for five minutes in 7 ounces of water. To the filtered solution is then added—

|                      |   |   |   |   |     |           |
|----------------------|---|---|---|---|-----|-----------|
| ℞ Mentholis          | - | - | - | - | -   | gr. iiij. |
| Tincturæ Cannellæ,   |   |   |   |   |     |           |
| Misturæ Mucilaginosæ | - | - | - | - | ana | ℥i.       |

Misce. Fiat mistura.

The mixture acts as an antiseptic and controls nausea and vomiting.

5. In hyperchlorhydria.

|                        |   |   |   |   |   |         |
|------------------------|---|---|---|---|---|---------|
| ℞ Mentholis            | - | - | - | - | - | gr. iv. |
| Sodii Phosphatis       | - | - | - | - | - | gr. i.  |
| Sacchari Crystallizati | - | - | - | - | - | gr. ss. |

Misce pro cachet. iii.

"One to be taken after each meal."

6. In hysteria.

|                       |   |   |   |   |     |          |
|-----------------------|---|---|---|---|-----|----------|
| ℞ Mentholis           | - | - | - | - | -   | gr. xij. |
| Potassii Bromidi      | - | - | - | - | -   | ℥ij.     |
| Tincturæ Gentianæ     | - | - | - | - | -   | ℥iiss.   |
| Misturæ Mucilaginosæ, |   |   |   |   |     |          |
| Aquæ Chloroformi      | - | - | - | - | ana | ℥v.      |

Misce. Fiat mistura.

"One tablespoonful to be taken four times a day after meals."

#### LOCAL TREATMENT OF CHRONIC RHEUMATISM.

Dardel of Aix-les-Bains finds the following useful in the treatment of chronic rheumatism. Liniments or ointments containing belladonna as:—

|                         |   |   |   |   |         |
|-------------------------|---|---|---|---|---------|
| ℞ Cocainæ Hydrochloridi | - | - | - | - | gr. xv. |
| Extracti Belladonnæ     | - | - | - | - | ℥i.     |
| Paraffini Mollis,       |   |   |   |   |         |
| Adipis Lanæ             | - | - | - | - | ana ℥v. |

Misce. Fiat unguentum.

Dieulafoy in some cases orders a poultice which Trousseau made use of, and which he calls *Trousseau's poultice*. Some crumbs of bread, moistened with water, are placed in a *bain-marie* for three hours. The cake thus formed is then kneaded with spirits of camphor until it has the consistency of putty. It is then spread out on a compress and on the surface is poured:—

|                      |   |   |   |   |                |
|----------------------|---|---|---|---|----------------|
| ℞ Camphoræ           | - | - | - | - | ℥iiss.         |
| Extracti Opii        | - | - | - | - | ℥i.            |
| Spiritus Rectificati | - | - | - | - | q.s. pro diss. |

The poultice is then applied directly over the joint and covered with oiled silk. It is left in place for 8 or 10 days. Good results are obtained in the sub-acute arthritis of infective rheumatism.

Tessier and Roques often use the sub-gallate of bismuth, which has an useful vaso-constrictor effect upon the effusion in the joint. It also has analgesic properties. It may be applied to the joint as ointment in the following form:—

|                        |   |   |   |   |      |
|------------------------|---|---|---|---|------|
| ℞ Bismuthi Subgallatis | - | - | - | - | ℥ij. |
| Paraffini Mollis       | - | - | - | - | ℥x.  |


Misce. Fiat unguentum.

A covering of wool should be applied to the joint.

**THE DIAGNOSTIC IMPORTANCE OF THE  
TOE-PHENOMENON (BABINSKI'S SYMPTOM).**

Babinski has described a modification of the plantar reflex to which attaches a very great clinical importance, because it serves to distinguish a functional hemiplegia from an organic hemiplegia, and, in the case of a paraplegia, denotes that an alteration exists in the pyramidal system. He calls it the "toe-phenomenon," but it is widely known as "Babinski's symptom." In a normal subject, when the plantar region is lightly touched with a pin or a pencil, the toes are flexed upon the sole, and, sometimes, there is also produced a defensive movement of the foot. The latter, though not a true reflex, must be noted for recognition. In a patient suffering from an organic lesion, on the other hand, there is an inverse movement produced by the same stimulus. The toes, especially the great-toe, are straightened out in extension. Sometimes an abduction of the toes is produced, called the "fan symptom," which is very characteristic. The toe-symptom is not quite constant in the case of organic lesion, but when it exists, provided it has been properly observed, it is decisive and denotes a lesion of that kind.

At the Hôpital de la Pitié, during one of his *conférences cliniques*, Babinski showed a patient in whose case the usefulness of this method of diagnosis was very clearly demonstrated. A woman of 51 years, complained of some weakness in the lower limbs, a sort of paresis, not painful, not interfering with walking, but only bothering her by fatigue coming on so very quickly. The knee-jerks were good, even a little exaggerated. Taking the general appearance of the patient and the absence of other well-marked symptoms into consideration, it seemed at first sight to be a case of functional paralysis. If the plantar reflexes had not been tested, such a diagnosis would have been made. But this idea had absolutely to be put aside when these reflexes were examined. The toe-symptom and the fan-symptom were at once clearly in evidence. There was, therefore, no doubt as to the existence of a pyramidal lesion. It was rather difficult to determine the exact nature of this. The paresis had been present for a week only, but the patient had suffered for six years with very sharp pains in the head and some defects in speech. There was no history of syphilis obtainable. The great practical interest of the case was the fact of being able at a first examination to prove the existence of an organic lesion. For such a case, rest is indispensable in order to effect a cure. If a diagnosis of hysterical paralysis had been made, walking and, more or less, active exercises would have been ordered. These would have made the patient much worse.—(*Journal de Médecine et de Chirurgie pratiques*.)



## Reviews of Books.

*Selections from the Writings of the late Sir William Broadbent, Bart., K.C.V.O., M.D., F.R.C.P., F.R.S., D.Sc., LL.D.* Edited by WALTER BROADBENT, M.D., M.R.C.P. Pp. 444. London: Oxford Medical Publications. 15s. net.

THIS book contains a selection from the numerous papers written by the late Sir William Broadbent upon various medical and neurological subjects, and includes his last completed paper on "The Examination of the Heart." The Editor has wisely chosen some papers for their historic interest, some to illustrate the variety of his father's work in the early days of his career, and the greater number for the matter which they contain, an arrangement which must interest the medical man of to-day. The Editor deserves the thanks of the Profession for having presented to it, in its present form, this most valuable collection of papers, for it may be truly said that the late Sir William Broadbent was pre-eminently one of the leaders of modern medicine.

*Polypus of the Nose.* By EUGENE S. YONGE, M.D. Pp. 174. London: Sherratt and Hughes.

THIS work is a welcome addition to modern rhinological literature, and will be read with attention by both specialists and general practitioners. Published with the threefold object of making known the author's investigations into the pathology of nasal polypi, of giving as full an account as possible of the whole subject and literature, and of discussing the various methods of treatment, especially as applied to radical cure, the book is a valuable record of scientific experimental investigation. The most likely theories as to the pathogenesis of nasal polypi are discussed, and certain much debated ones, as that of Woakes' "necrosing ethmoiditis," lately revived in a modified form by Lambert Lack, are demolished by sound scientific reasoning. Yonge's own theory, as given in his own words, is "that polypi are œdematous hypertrophies of the nasal mucous membrane the indirect result of certain mechanical changes in the glands." The experiments and conclusions therefrom, upon which he bases his contention, are best read in the original; they are certainly very strong evidence of the correctness of the theory.

The chapter upon treatment is clear, concise, and adequate, and is followed by short Appendices on "Bleeding Polypus of the Septum," and the bacteriology of simple polypus.

The author is to be congratulated upon an exposition, which is not only concisely and clearly expressed, but is written in the true scientific



spirit.

*Electrical Treatment.* By WILFRED HARRIS, M.D., F.R.C.P., Physician to Out-patients, Physician to the Department for Nervous Diseases, and Lecturer on Neurology, St. Mary's Hospital; Physician to Out-patients, Hospital for Epilepsy and Paralysis, Maida Vale. London: Cassell & Co., Ltd. 7s. 6d.

THIS book can be confidently recommended to practitioners and students, as one which will serve them well. It has the advantage of having been written by one who is an accomplished neurologist, as well as an authority on the use of electricity, and so we get a just idea of the advantages which may fairly be expected from electrical treatment in diseases of the nervous system.

After a general account of the methods of employing the different forms of electricity, the uses of the Faradic current are considered in detail. Next, the galvanic current is treated in a similar manner, and, after that, we have chapters on electric baths, the sinusoidal currents, electric light baths, X-rays, static electricity, and high frequency currents. This method of arrangement, combined with a good index, makes reference easy.

An important feature in the book is the detail, with which the instructions for treatment are given, thus enabling anyone, who is not very familiar with the methods, to follow them out easily. There are also many good illustrations.

*The Pathology of the Eye.* By J. HERBERT PARSONS, B.Sc., D.Sc. F.R.C.S., Assistant Ophthalmic Surgeon, University College Hospital; Assistant Surgeon, Royal London Ophthalmic Hospital; Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street. Vol. IV. London: Oxford Medical Publications. 15s. net.

THE present volume contains Part II. of the General Pathology of the Eye. It includes eye-injuries, an account of exophthalmos, and enophthalmos, panophthalmitis, orbital cellulitis, and thrombosis, and thrombosis of the cavernous blood sinus. There is an excellent chapter dealing with sympathetic ophthalmitis, or, as the author prefers to call it, sympathetic ophthalmia. This also contains a full account of the symptomatic diseases of the eye, which will be particularly useful to the general physician and neurologist, as well as to the ophthalmic surgeon. The last chapter deals with hereditary eye-affections. The work is very carefully produced, excellently illustrated, and in every way is as good as the former volumes. The value of the research work of the author, and the obligation under which he has placed the profession by the production of these excellent volumes have gained for him the Nettleship Gold Medal of the Ophthalmological Society of the United Kingdom.

*Diet in Tuberculosis: Principles and Economics.* By N. D. BARDSWELL, M.D., M.R.C.P., Medical Superintendent, King Edward VII. Sanatorium, and J. E. CHAPMAN, M.R.C.S., L.R.C.P., Medical Superintendent, Coppin's Green Sanatorium. London: Oxford Medical Publications. 6s. net.

THE prognosis in tuberculosis, during the last quarter of a century,

has greatly improved. This is chiefly due to the recognition of certain principles, which have been carried out most systematically at Sanatoria, but which are within the reach of all, namely:—the carefully ordered life, freedom from fatigue and worry, carefully regulated hours of rest and exercise; and, most important of all, abundance of fresh air and generous but not excessive diet.

This little book contains a very full account of the subject of the diet in tuberculosis, both from the scientific and from the practical point of view, and the practitioner can be confidently recommended to consult it for any information which he may require on this subject.

*Intercellular Enzymes.* By H. M. VERNON, M.A., M.D., Fellow of Magdalen College, and Lecturer on Physiology at Exeter and Queen's Colleges, Oxford. Pp. x + 243. London: John Murray. 7s. 6d. net.

THIS little book is the extension of a course of lectures delivered at the Physiological Laboratory of the University of London.

It is half a century since Claude Bernard made the suggestion that the conversion of glycogen into glucose was due to the action of a ferment, acting within the confines of the liver-cell. However, until very recent times, our knowledge of enzymes was limited to those present in the digestive sections. Fermentation processes, produced by living organisms, were ascribed to a "vital activity," and it was not until 1897, when Buchner showed that the expressed juice of living yeast cells could decompose dextrose into alcohol and carbon dioxide, in precisely the same manner as the living yeast cell itself does, that the true nature of these processes was understood, and the existence of intracellular enzymes (endoenzymes) demonstrated. Since this time, numerous experiments on autolyses, and with extracts (glycerin and aqueous) of minced tissue cells, have shown the existence within these cells of hydrolytic enzymes, of divers kinds, and in countless variety. Indeed, with succeeding years, it has become more and more apparent that cell-life, with its complex metabolic processes, syntheses, decompositions, oxidations, etc., is probably the result of the action of a complication of different numerous endoenzymes, the actions of which are modified at any particular moment by the conditions obtaining in the cell, such as the distribution of colloids, crystalloides, electrolyses, etc., and possibly also by the existence of anti-enzymes, and other enzymes. At any rate, whether true or no, this hypothesis, with our knowledge of metabolic processes in its present condition, furnishes a good basis for further research.

Dr. Vernon, in his book, deals systematically with the individual intracellular enzymes and their properties. He has presented, for the first time in English, the widely scattered literature of the subject, gathered into a convenient and accessible form, literature which he, himself, has helped to produce. His researches on autolyses, and endo-enzymes, particularly erepsin, are widely known. The book is well written, accurate, interesting, and very suggestive. It should be read carefully by all thoughtful

physicians and biologists.

*Bacteriology of the Eye.* By Dr. THEODOR AXENFELD, Professor of Ophthalmology in the University of Freiburg. Translated by ANGUS MACNAB, B.A., B.Sc., M.B., Ch.B., F.R.C.S., Chief Clinical Assistant, Royal London Ophthalmic Hospital. Pp. 410. London: Baillière, Tindall & Cox. 21s. net.

As is well known Dr. Theodor Axenfeld has, by his thorough and careful investigations, done much to advance our knowledge of the bacteriology of the eye, and Mr. Macnab must be heartily congratulated upon having so carefully translated Dr. Axenfeld's excellent work into English. The book is profusely illustrated, many of the illustrations being beautifully coloured. The references are numerous and well arranged, and this very materially adds to the utility of the book.

*The Functional Inertia of Living Matter.* By D. FRASER HARRIS, M.D., F.R.S.E., Lecturer on Physiology, University of St. Andrews. London: J. & A. Churchill. 5s. net.

THE sub-title of this small brochure is "A Contribution to the Physiological Theory of Life," and is based on the recognition of two physiologically complementary properties in protoplasm, namely:—affectability and functional inertia, and that this recognition is of the greatest assistance to the logical perfection of our conceptions regarding the *modus operandi* of the activities of living matter. Dr. Harris considers that, by postulating a second fundamental property, viz., functional inertia, as residing in the biogenic complex and functional complexity, we are afforded a fuller insight, than we have at present, into what one might call the "true inwardness" of living matter. It will thus be seen that this little book will be of greater interest to the physiologist, and to the philosophical reader than to the busy practitioner of medicine.

*Your Child's Health.* By JOHN GRIMSHAW, M.D., B.S., D.P.H. Pp. 144. London: J. & A. Churchill. 2s. 6d. net.

THERE is a great deal of useful information in this work, and we are glad to see that it is not written too much in the "popular" way. All through, the information is given in a very practical and straightforward manner, and it is remarkable how much useful work has been got into the 144 pages.

The writer has had much practical experience of children, both individually and in schools, and his common-sense suggestions for preserving the health of children are excellent.

The only point that we have room to criticise, in this short review, is the chapter in which "stammering" is discussed. In this there has been too much condensation, and we think that another page or two given to the subject would convert an article, at present not very easy to understand, into a really useful chapter.

There is so much at present in the air, with regard to school inspection and the examination of children, that we are sure that this book will find a ready market; and we may add that it is a very good half-crown's worth.



## Preparations, Inventions, etc.

### GLUCAPHEN.

(London : F. A. Rogers, 327, Oxford Street, W.)

We have received a sample bottle of Glucaphen, and find that the claim that Glucaphen is a nutritive tonic food is substantiated. The product is a compound containing the proteid ingredients of milk and wheat, amongst which may be mentioned caseinogen, glutenin, and gliadin, combined with suitable small doses of glycerophosphates. The solubility of Glucaphen and the easy assimilability of its ingredients render its exhibition in cases of recovery from acute illnesses and wasting diseases a course to be recommended, especially in those instances where it is advisable to adopt prompt measures for improvement. A point to be remembered in connection with the use of Glucaphen is that it should not be administered with anything of an acid character. The statement made by the manufacturer that the preparation is free from impurities is borne out by examination, and further, if care be taken to preserve it from the air and moisture it does not depreciate on keeping. Glucaphen is specially adapted for patients with weak digestive processes, and it also can be taken as a separate ingredient in the daily dietary ; it can be used with most forms of food in daily use, as, for instance, cocoa, warm milk, broth, or soup ; as a dry powder, it can be stirred up with porridge or added to bread and milk.

### NORIDAL SUPPOSITORIES.

(London : Anglo-Continental Chemical Works, 63, Crutched Friars, E.C.)

A sample of Noridal suppositories has been forwarded to us for examination and report. It is claimed for these suppositories that they are especially adapted for the treatment of hæmorrhoids ; the mucous membrane is softened and lubricated by the fatty substance in the suppositories, and by reason of the fact that this preparation is devoid of any narcotic, the employment of this medication can be carried on for a pro-

longed period. The unpleasant itching so often accompanying the presence of hæmorrhoids is alleviated and relieved by the astringent and healing effect of these suppositories. It is further claimed that the venous condition of the parts concerned in hæmorrhoidal attacks is materially influenced by the shrinkage of the tissues and the prevention of any accompanying hæmorrhage. The confident manner in which the above claims are set forth can be to a certain extent explained by a consideration of the composition of the Noridal suppositories, which contain the following:—Calcium chlorate, 0·05 grm.; Calcium iodate, 0·01 grm.; Paraneprhin, 0·0001 grm.; and Balsam of Peru, 0·01 grm. The powerful vaso-constricting action of paraneprhin is well recognised, and there is no doubt that this active principle of the suprarenal gland is a most efficacious hæmostatic-coagulating astringent. To these properties of the paraneprhin are added the therapeutical value of the calcium salts enumerated in the composition of these suppositories, whilst the healing and antiseptic character of balsam of Peru is a useful adjunct in rendering the suppositories of value in the treatment of hæmorrhoidal affections.

#### SANITARY COVERS.

(Liverpool: Sumner & Co., 50A, Lord Street.)

Special covers for vessels containing milk, sugar, and other food likely to be contaminated by flies have been received by us from Sumner & Co. The printed matter sent with these covers contains an extract from the writings of Dr. V. J. Glover on the subject of the house-fly being the carrier of infection to milk and so to infants. The covers are of a simple make, and form efficient screens for vessels containing milk and cream, and there is no doubt whatever that they supply a simple and important aid towards the prevention of disease during the summer months.

#### DIAMALT.

(London: British Diamalt Co., 11 and 13, Southwark Street, S.E.)

In the May issue of THE PRACTITIONER for this year we had occasion to comment on the manner in which a sample

of Diamalt submitted for our notice by the British Diamalt Company was packed. We now have pleasure in stating that we have received from the British Diamalt Company a jar of Diamalt showing us how the product is placed on the market. This packing, as evidenced by the specimen now sent for our investigation, is in every way suitable and convenient; it is a matter for congratulation to all concerned that when ordering Diamalt the practitioner can be sure, not only that the patient will receive a pure extract of malted barley containing the necessary proportions of proteids and diastase, but also that the preparation will reach the patient packed in a manner commensurate with the value of the product.

#### KLORAM.

(London : Frank A. Rogers, 327, Oxford Street, W.)

Medical men have hitherto been deterred from ordering nascent chloride of ammonium vapour in the treatment of ear disease in consequence of the uncertainty of the action of certain forms of chloride of ammonium inhalers in use. Mr. F. A. Rogers has sent for our inspection a new chloride of ammonium inhaler, which he has called the "Kloram." This machine is decidedly an improvement on the older varieties of inhalers, and the inventor is justified in his contention that, by the thorough manner in which the vapour is washed in the machine, any super-acidity or alkalinity is effectually removed, with the result that the vapour produced is in a pure and unirritating condition. The ability to obtain a pure and neutral vapour of chloride of ammonia of unvarying quality and density is undoubtedly of great advantage to those who favour this method of treatment. This inhaler is strongly made and simple to work, and is provided at a moderate price in a conveniently arranged box.





### Notes by the Way.

THERE was a time not so far distant when  
Then and Now. specialism was looked upon as being in itself  
a stamp of quackery. Conservatism is always  
strong in the medical synagogue ; this is natural seeing that  
the high priests of the profession have necessarily reached the  
age when the human mind, according to Goethe, becomes  
impervious to new ideas. At an opening address delivered to  
the Medical Society of University College, London, the late  
Sir John Russell Reynolds, in 1881, denounced specialism as  
retrogression rather than evolution, and as the survival not of  
the fittest, but of the charlatan and the quack. He attempted  
to classify specialities as follows :—"First of all there is the  
distinction between those who deal with men, women, and  
children ; then, secondly, those who treat either of those  
groups of patients as being sane or insane ; thirdly, those who  
divide certain parts of the human being upon a somewhat  
regional, anatomico-physiological basis, and take as their fields  
for cultivation the nervous system, respiratory system, diges-  
tive system, and the like ; fourthly, those who make particular  
diseased conditions, such as gout, fever, or consumption, their  
line of study ; fifthly, those who take special lines of work,  
such as medico-legal practice, into courts of law." On all these  
the distinguished physician pronounced an impartial anathema.  
Sir John Russell Reynolds himself said that he had known  
"distinguished surgeons go down into the country to say  
whether or no a patient with rheumatic fever had endo- or  
pericarditis, when neither of them would know which end of  
the stethoscope to use." He further said that he had known  
"physicians treating onychia or stone, and doing minor opera-  
tions in surgery for which, as the results proved, they were  
quite incompetent."

We may add that we have known a most eminent physician  
at about the date of Sir John Russell Reynolds' discourse  
vehemently deny the existence of adenoid growths. We  
have also known a galaxy of consultants who agreed that  
the proper course was to feed up a young man sore stricken

with syphilis, nonplussed when the patient told them that owing to the ulcerated state of his throat, which they had not attempted to examine, he was unable to swallow. A specialist had to be called in to treat the case, whereupon the consultants retired in disgust. Mr. Butlin has given an amusing account of his own experience. When it became evident to the medical staff at St. Bartholomew's Hospital that if proper instruction was to be given to their students a department for diseases of the throat must be created, Mr. Butlin, being the junior assistant surgeon, was, as he said, pitchforked into the charge of a specialty which he did not care about, and expected to treat patients whose diseases he could not diagnose, and to teach students the use of instruments which he could not use himself! Since then a change has come over medicine, Russell Reynolds believed that specialism would die out, but the tendency is to carry specialism to excess. The body is parcelled out among specialists as "claims" are "pegged out" by miners. Each orifice has, as an eminent surgeon said, a number of workers buzzing about it like flies.

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Mr. Dooley on  
Doctors.

WE are not far from the state of things described by Mr. Dooley. Readers of that acute philosopher may remember how he goes to a doctor who takes his temperature, examines his blood, and so forth. "By that time (says he) I'm scared to death, an' I say a few prayers, whin he fixes a hose to me chest an' begins listenin'." "Annythin' going' on inside?" says I. "'Tis ye'er heart," says he. "Glory be!" says I. "What's th' matther with that ol' ingine?" says I. "I cud tell ye," he says, "but I'll have to call in Dock Vinthrice, th' specyalist," he says, "I oughtn't be lookin' at ye'er heart at all," he says. "I niver larned below th' chin, an' I'd be fired be th' Union if they knew I was wurrukin' on th' heart," he says. So he sinds f'r Dock Vinthrice, an' th' dock climbs me chest an' listens, an' then he says: "They' se somethin' th' matther with his lungs too," he says. "At times they're full iv air, an' again," he says "they ain't," he says. "Sind f'r Bellows," he says. Bellows comes and pounds me as though I was a roof he was shinglin'

so as to secure increased powers for the central authorities, at the same time doing away with the legion of local enactments that at present exist. The problem is so far-reaching that the necessity for international legislation must be recognised. This must be admitted, for the reason that if a general Act for the country as a whole is needed, then attention must also be given to the purity of the milk supplies from abroad. We consider that the clearest indications exist pointing to the fact that those engaged in the milk trade would welcome new legislation dealing with the subject not only at home but also abroad. Dr. Priestley exactly describes the condition of affairs when he says that matters are in a chaotic state, and the bewildering complexity of the various Acts of Parliament constituting authorities with overlapping jurisdictions and conferring increased powers on some districts whilst refusing them to others, presents a deplorable spectacle of ineffectual muddle that calls for drastic treatment.

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# THE PRACTITIONER.

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## CANCER OF THE BREAST, AND ITS EARLY DIAGNOSIS.<sup>1</sup>

By ANTHONY A. BOWLBY, C.M.G., F.R.C.S.,

*Surgeon to St. Bartholomew's Hospital.*

CANCER of the breast is not one and indivisible, and we usually have in our minds when we speak of cancer of the breast "scirrhus cancer," and it is of that form that I propose to speak to you. But I will briefly enumerate for you the varieties of cancer of the breast.

First, there is what is best called "Villous cancer," but is also called "Duct cancer," and that is a form of carcinoma which is very mildly malignant. It may be compared in this respect with rodent ulcer in another part of the body. Neither of these forms of carcinoma do more than locally infiltrate; they are characterised by the things that they do not do, for they do not disseminate, and they do not, as a rule, infect the lymphatic glands. But this form of carcinoma is by no means of the same importance as the common scirrhus type, because it is so much less frequent, and about it I have nothing to say on this occasion.

Then, there is a variety of scirrhus cancer which is called "Colloid cancer," but it is only a variety, though it grows more slowly and is less malignant, and of it as a separate entity I have nothing to say either. There are two forms of the ordinary "spheroidal-celled" carcinoma, or "glandular" cancer of the breast, which appear at opposite ends of the pole as far as malignancy is concerned. One is what is called "atrophic cancer," which, growing particularly in old people, grows with extreme slowness, and is characterised by the shrivelling or puckering and diminution in size of the breast in which it occurs. That is the reason the name

<sup>1</sup> A Clinical Lecture delivered at St. Bartholomew's Hospital.

atrophic cancer is given to it, because the breast "atrophies" under its presence. It grows slowly but surely. It takes years to accomplish what an ordinary form of carcinoma will do in a much shorter time. In many cases the patient goes on living until she ultimately dies from some other intercurrent disease, the carcinoma perhaps having been present for any length of time between ten and twenty years.

At the other end of the scale is that very rapidly growing form of carcinoma which I think is best described as the "acute inflammatory form" — that form in which there is redness and œdema, just as you find it in inflammation or suppuration of the breast, and in this form not infrequently both breasts are affected. These cases run such an extremely rapid course that in my experience no operation intervenes in time to save the patient's life. But, fortunately, this also is a comparatively rare form of carcinoma. I mention these varieties for the purpose of putting them aside; not that they are not of much importance by themselves, but because they do not represent the common form of cancer of the breast.

We will now revert once more to the common form, because it is of that alone I wish to speak to you. Just consider for a moment what the tumour is like and the course it runs. A scirrhus cancer of the breast is, as its name implies, hard, and "hard cancer" is the name which has been given to it by the British public. And on section, in its most typical form, it is like a scar, fibrous and whitish. That is the densest form of this hard kind of cancer. But not all hard cancers of the breast are as hard and scar-like as that. There is a less fibrous form, a softer form of carcinoma, and one with a little more colour in it, a good deal of the tumour may be quite pink, not a white scar-like structure. In these growths in the midst of the tumour, globules of purulent-like material, or, if you prefer the name, cream-like fluid may be present. It is not pus. I shall speak later on about this same appearance in other forms of breast disease. This really is the secretion of the cells of the diseased breast. You know that normally the cells of the breast in pregnancy form milky fluid. In disease they may do the same. That is true of many other cells of cancer in different parts of the body; they may form a definite secre-

tion. These cancers come under the heading of spheroidal-celled carcinoma of the hard or scirrhus type.

Next let us look briefly at what is going to be the course of a tumour of this kind, because it is by knowing what happens to tumours of this sort while they are in existence in the human being that you are able to tell clinically what the nature of the tumour is. These tumours will destroy the neighbouring structures; their cells are, as it were, parasitic cells: they eat and destroy and live upon the cells of the tissues around them. And in that way they destroy the superjacent fascia and the skin, and the cancer takes the place of those structures. That is what is meant by infiltration. And the cancer extends deeper too, and it destroys the muscle fibres. It will extend through and reach and erode the rib also and destroy that. So that you must remember cancers live at the expense of their host. And not only do they do this locally, but they tend to reproduce their kind: they sow their seed, and that is the most important way in which they show their malignancy. A malignant tumour is characterised by the way it infiltrates and destroys, instead of thrusting aside and displacing, tissues: it lives upon them, and replaces them by itself. And, as I have just said, it also scatters its seeds. By means of the lymph stream and the blood stream the cancer cells get distributed, and in places which it finds favourable to itself it develops again and forms secondary tumours. If the primary cancer is taken away before it has had time to sow its seed in other parts, there is an end of the disease. But if you leave the tumour until it has sown and scattered its seed to the bones or the viscera, no operation will save the life of the patient. These tumours scatter their seeds primarily into the nearest lymphatic glands, which appear in many cases to temporarily arrest the further extension of the disease. But they do not permanently arrest it. And in other cases you must remember that the lymphatics which are affected, the glands which are involved, are not within sight or touch. Some of the lymphatics of the breast pass through into the mediastinum, and the consequence is you may be feeling for enlarged glands in the axilla when really there is a growth due to the cancer inside the chest. The trouble may also extend to the glands above the clavicle. And therefore, as far as operation is concerned,



there arises the question : Is it advisable or necessary to remove the supra-clavicular glands as well as the axillary glands? I will tell you my experience of that. I have done it many times, and I shall probably do it again, but I have never yet succeeded in permanently saving the life of the patient in whom the cancer has extended as far as the supra-clavicular glands. Because, when cancer has got as far as that, it has almost certainly also gone further. So I do not now expect patients permanently to survive operation for cancer if the disease has extended as far as those glands. Cancer may infect in all these different directions : there is no viscus in the body which cannot be involved by it. It also shows a peculiar tendency to affect certain bones, and especially the humerus of the affected side, the sternum, the femur, and the dorsal vertebræ. The length of time that the patient with cancer lives will depend apparently on the rate at which the particular tumour happens to grow and disseminate, and to some extent on what particular viscus happens to be involved. So that, for example, whilst not much else in the body appears to be infected, a tumour growing inside the brain may terminate the life of the patient, who, as far as any local disease is concerned, appears to be practically cured. That is a feature which you have to recognise and contend with.

Next we have to look at the clinical aspect of the disease, for what I have told you represents the natural history of the growth. In the first place, the people in whom this disease occurs are by far most frequently women, and because that is so I shall speak as if the subjects of the disease were women only. It does affect men, but in so much smaller numbers that I shall not consider them at present.

The next point is, How do women first come to notice that they have cancer? A woman comes to you with a tumour in her breast. You ask her how long she has noticed this. You say to her, "What made you find it?" The answer almost invariably is that it has been found by chance, and there are two ways in which this ordinarily occurs. One is that the woman may notice it either from directly viewing her breast, or by seeing in the mirror that one breast is altered in shape and is flatter than its fellow. The other way, which is the more common, is that in drying herself

with the towel, but more often in washing herself with the flat of the hand, a lump is felt. Now, if this is the way in which these lumps are ordinarily discovered, it follows that they may have been there a great deal longer than the patient knows of. For it may happen that a lump may be of very considerable size before it is observed at all, and in that case you can only draw the conclusion that it must have been there a considerable time before it was discovered. And the further conclusion which you may draw is that it must have been painless. I wish it could be written as large as possible in the mind of the public that—*Cancer is painless in its early stage*. It seems impossible at present to make people thoroughly understand this. Over and over again one is told by a patient: "Yes, I have known of a lump there during the last six months, but as it did not cause me any pain I did not suppose it could do me any harm." That is a thing which we are told so frequently that it is evident the ideas of cancer and painlessness are not associated in the public mind, and indeed, I am not sure that they are sufficiently associated in the medical mind either. Later on cancer is painful, for it will cause pain in proportion as it reaches and presses upon or draws upon the small nerves which lie in contact with the breast. It often is much more painful when it affects the axillary glands and causes adhesion or pulling or pressure upon the intercosto-humeral nerves than when it is in the breast. But there always comes a time when cancer becomes painful, though often by the time it becomes painful it has passed beyond the stage at which it can be cured by operation. Yet you must not suppose that all cancer which is painful is necessarily beyond cure by removal.

Next as to the examination of the patient. What can you see before you put your hand on the breast at all? You must use your eyes. I said just now that the patient not infrequently noticed that the breast was altered in shape. There is not generally sufficient attention paid to that fact. The first inclination of everyone when he comes to examine a breast is to put his hand upon it, and in that way he covers up what may be a most important point. Look at the breast first before you feel it. A breast with carcinoma in it is not usually swollen, though you might naturally expect that a

woman with a cancer in her breast will have that breast enlarged. But the breast where the tumour is situated is often flattened, and its normal outline is altered, so that you may see that a woman has cancer in her breast without ever putting your hand upon it, and you may even see it more certainly than you can feel it. You can see not merely that the whole breast is altered in shape by this flattening, but in many cases you can see that the skin is puckered or crinkled ; that it is slightly drawn in, that the nipple is slightly bent in if the tumour is near the nipple, and not at all if it is not situated there. And, later on, if the cancer is getting near to or involving the skin, you will see that the skin becomes altered in colour, showing a red area where the cancer reaches the skin. You see these things before you touch the breast at all. And let me advise you to see both breasts, and you will sometimes see that the level of the nipples is altered, because these tumours situated above or below or to the outer side or to the inner side of the nipple will tend to draw it towards their own side. Displacement of the nipple you can only notice by seeing the other breast as well. Next you feel the breast, and you do so by putting your hand flat upon it, not by lifting it up. Any breast may feel more or less hard, especially old breasts, which are much harder than young breasts. But that hardening to a great extent disappears when you lay your flat hand on it and press it backward towards the ribs behind. Yet by this same pressure you will notice that there is, in scirrhus cancer, a definite lump to be felt ; not an indefinite lump, but one with defined, hard, irregular knotty edges. And you will find in a good many cases in the earliest stage, when this lump is quite small, that it is quite moveable, not in the least fixed, and at first the skin over it is not adherent, and the breast is not flattened. What you will find in the case of these tumours will always depend to some extent on the stage at which you see them. You will notice that everybody is rather inclined to have pressed upon them the idea that a cancer becomes fixed. So it does, but not at the beginning. A cancerous tumour, beginning, perhaps, under a good deal of fat inside the breast, not near the surface of it, but in the substance of the gland, is perfectly moveable. It is as moveable as an adenoma. Why should it not be ? There is



nothing to prevent it moving, it is only as it extends that it becomes fixed. Never allow yourself to be put off by the fact that this irregular tumour with the definite edges is moveable, because every cancer is moveable at first, just as every cancer is painless at first. Immobility means extension of the growth, and so, in a general way, does pain. This tumour, then, is characteristically hard, with definite edges and a knotty firm margin, in whatever direction you feel. But it will now be evident to you that the nearer the tumour is to the surface the more easy it is to appreciate these conditions, and when the tumour is in the deepest portion of the breast, and when it is covered over by half an inch of fat, you cannot feel all these things. In the case of a cancer in the middle of the breast of a large fat woman you cannot feel everything that I have described to you. You can feel them in a superficial tumour, and in a tumour deeply situated in a thin breast you cannot feel them. If there is half an inch of fat and half an inch of gland tissue, you will find a very ill-defined swelling. In proportion as the growth has extended towards the skin you will feel that the skin cannot be lifted up, for you can feel what you may already have seen, that the skin is drawn down from beneath. Then you feel for glands. Never let the absence of enlarged glands affect in any way your judgment as to the nature of a tumour. The presence of enlarged hard glands has an importance of its own, for it indicates that the disease is no longer limited to the breast; but that the glands are *not* involved means nothing. In the early stage of cancer of the breast there is no pain, in the early stage there is no fixation, in the early stage there are no enlarged glands to be felt. If you wait for all these things to be evident you wait too long. You must not wait for them.

Now, supposing you have a case in which the nature of the trouble is not clear to you, in which the tumour is not as definite as you would like it to be, or in regard to which you feel uncertain as to diagnosis. You will now have to think that, if this is not quite certainly a cancer, what else can it be? We will take a case. The patient is a woman over 40 years of age: she may be 50, 60, 70 or 80. But she is over 40. What other lumps occur commonly in the

breast, besides cancer, in a woman past 40 years of age? Two. Mastitis, so-called "interstitial mastitis," and cysts. Now it is evident that if you have to differentiate cancer from these two conditions, you must know what these conditions are like, and how they present themselves in the patient. What is called interstitial mastitis is a hardening of one or more of the lobules of the breast. You must remember that in women over 40, and still more in women over 50 or 60, the gland is no longer so soft as in earlier years: it is a harder structure. The gland undergoes atrophic changes, just as the uterus and the ovaries do, at that time of life; for, as the uterus becomes smaller and shrinks and becomes altogether a harder organ, so, also, the breast of an old woman is a different kind of organ to that of a young woman. In the breast of an old woman you can see under the microscope that the gland tissue has to a great extent disappeared and its place has been taken by fibrous tissue: the whole breast is quite fibrous in structure. Now, what is not sufficiently appreciated is the fact that if you examine on section the breasts of any old woman over 50 years of age, you generally find a good many little cysts, and it is these tiny cysts which to a great extent give rise to the hardness of so-called interstitial mastitis. "Interstitial mastitis" is a very unfortunate name, because it implies inflammation of the breast. But there is really nothing inflammatory about this change: it is a degenerative change. It may be more marked in one lobule of the breast than in others. So that the affected lobule may be harder than its neighbours, but there is not the same definite edge and outline that you find in cancer. It is a much flatter hardening, but it never causes flattening of the breast, it never pulls in a nipple, it never causes adhesion of the skin, and, therefore, if the lump in the breast is somewhere near the skin and it has not caused any of these things you may be sure it is not cancer. The other thing which is of importance is that interstitial mastitis is very often multiple. Of course, people at first are inclined to think that their trouble is very serious if they have two or three lumps in the breast, but the surgeon, I need scarcely say, is rather pleased to see it, because cancer never occurs in two or three places in one breast at the same time. If you find two or three

rather ill-defined lumps in one breast, you may be sure that they are not all cancer, and the probability is that none of them are. The other condition from which you have to diagnose cancer is a cyst. I said just now that in the breasts of women over 50 years of age, you will find generally tiny cysts, and therefore it is at this age, in degenerating breasts, that cysts are common. If you feel for cysts you will find that, if large enough, they are round and elastic. If you put your hand on a breast you may feel that it contains a very hard lump, it is indeed so hard that it might well be the hardness of cancer, and when these cysts are deep in the breast and are covered by fat and breast tissue it is difficult to find that there is elasticity. But always try to ascertain whether a tumour is elastic and fluctuating, as a routine procedure. Even if you think it is a case of cancer of the breast, then you will not be so likely to overlook a cyst. But although a cyst may feel as hard as a cancer, it is more rounded, it has not the hard, irregular, knotty margin like cancer. And, like interstitial mastitis, these cysts are often multiple: several such lumps may be felt in one breast, or lumps may be felt in both breasts. And here again, as before, multiplicity is a favourable sign, because cancer of the breast never occurs in several separate places. It may occur in both breasts of the same woman, as a rarity, but it never occurs in separate places in the same breast. But if you are in doubt whether in a given case the lump is cyst or cancer, there is an easy way of settling the question, and that is by puncture. If you have doubt whether a patient has fluid in the pleura you do not hesitate to put in a needle, and if you are in doubt about a condition in the breast being cystic, put in a very fine trocar,—the finest is all that is necessary,—and the procedure will be proportionately painless; you can tell at once whether it is a cyst or not. Over and over again you can at once put the patient's mind at ease by bringing about the complete disappearance of the tumour by puncture in the course of a few seconds. That may be the end of the cyst, or it may possibly refill and require re-tapping. But do not waste valuable time and say, "I am not sure whether it is cyst or cancer, I will wait," for I am certain that puncture is the right thing to do in all cases of doubt of that kind. And that brings me to the next



point. Amongst the things which you are told you must diagnose cancer from is "chronic abscess." There are two causes only which I have recognised of chronic abscess: one is tubercle and the other is lactation. Sometimes miscarriage has the same effect. Tubercle is rare. When it does occur it does not merely, as a rule, cause an abscess, but rather an infiltration of the breast which is extremely like that of carcinoma, and it may have to be treated like carcinoma, namely, by removal of the breast. And it simulates carcinoma still further by causing as a rule a definite enlargement and very often fixation of the lymphatic glands in the axilla. And if you come to look up the records of cases of tubercle of the breast you will find that in a great proportion of them they have been considered to be cancer and have been removed as cancer, and it has only been after examination made subsequently to removal that it has been found that they were tubercular. Tubercular abscesses in the breast are rare. Parturition abscesses are common, and if a woman is known to have recently had a child and a lump occurs in her breast you will be likely to think at once of suppuration. But these are not the conditions to which I think most writers are so commonly alluding when they say that one of the things which you have to diagnose from cancer of the breast is "chronic abscess." They tell you of cases in which a tumour has existed in the breast apart from tubercle and nothing to do with parturition, in which an incision has been made and matter has been let out. But you must realise that such swellings are not real abscesses. They are really cysts containing purulent-like matter, which is really a creamy fluid. I have said that you can tell whether a tumour is a cyst by puncturing. What do you expect to come out? In most cases it is a slightly turbid serum, in some cases more or less blood-stained, not infrequently opalescent. Sometimes, however, it looks just like pus. But if you were to have one of these breasts examined you would find that the cavity in which this pus-like fluid existed was a perfectly smooth-lined cavity, and if you were to make a microscopical examination of its walls, as I have done often, you would find that it is lined with a definite layer of epithelial cells, and that is not the kind of lining of an abscess cavity. These are cysts.

Cysts may contain clear opalescent fluid, thick creamy milk-like fluid, or fluid of the consistence of thin butter. And in some cases it is of a peculiar greenish or slate-coloured tint. These so-called "chronic abscesses," then, are cysts, and when you talk of making a diagnosis of cancer from cyst you must remember that you are making it also from these other tumours which contain this milky, pus-like fluid. We will suppose you have eliminated the possibility of a tumour being a cyst, and that in a given case you are not sure whether it is cancer or interstitial mastitis. If you think that it is interstitial mastitis it is quite reasonable to treat that case as such with some simple treatment such as belladonna and Scott's ointment, applied locally to the breast and kept on for a week or two. If you find the lump disappears you are satisfied. But do not be satisfied unless it does disappear. Do not tell the woman she has interstitial mastitis and that she need not come to see you again. Tell such a patient that there is a "hardening of the breast," which is a common term to employ, and that it will probably go away, but that she must come to see you, so that you can know for yourself whether it does go away. For you may be wrong in your opinion, and then the only way in which you can safeguard that patient is by keeping her in view. And if you find that the lump does not go away, if the indefinite lump becomes more definite, if it becomes larger, do not hesitate to advise that an operation be undertaken. Because, if it is cancer, you will have caught it as early as possible; and, if it is not, you have perhaps done a needless operation, but you will have ascertained without doubt that the patient's life is no longer in danger, and you will have cured the trouble for which she consulted you.

Lastly, let us suppose that you have concluded definitely that the case is one of cancer. I do not propose at present to try to tell you the operation necessary for cancer of the breast. I will only say, in general terms, that what is of far greater importance than any particular method is that any operation to be successful must be done early, so that it may remove as widely as possible all the evident disease, and the glands in the axilla must necessarily always be taken away. And I will only add one word of warning: do not necessarily make the nipple the centre of the portion of the skin which

you propose to remove. Always make the centre of the portion of skin that you propose to remove that portion which is right over the tumour. There is some tendency to make the incision at a point which encloses a portion equally all round the nipple, but you ought to aim at cutting as much as possible around the area of skin which is superjacent to the tumour. You may do the operation by this surgeon's method or that surgeon's method : that is a matter of individual choice ; whether you take away both pectorals or one, whether you take away the supra-clavicular glands—these matters are not, in my opinion, of very great importance so long as you are satisfied that you have adequately removed the disease, with all the superjacent skin which is likely to be affected, all the fascia and muscle which are apparently likely to be involved and have cleared out as far as possible the whole axilla. When the operation is completed there is one thing which is not sufficiently kept in view : never put on a bandage of any sort to confine the patient's arm in any way. The arm ought never, after operation for cancer of the breast, to be confined in any way so as to restrict its movements. It is only comparatively recently that surgeons in general have come to leave these arms unbandaged. When I was house-surgeon, and for many years after, it was taught in every book on surgery that after the removal of the breast the arm was to be bandaged to the side, because, the pectoral muscle forming the base of the wound, all its movements prevented the wound from healing. But if you clear out the axilla and divide the muscles and take away the fascia and then bandage the arm to the side, think what happens to the raw surfaces which are left in this way. Of course, if you bandage the arm to the side the denuded muscles will grow together, just like the skin wound grows together, and the arm will then be kept permanently more or less fixed to the side afterwards by these adhesions, and the patient will have difficulty in moving it. You ought, in my opinion, to so bandage the breast that the arm *cannot* be brought to the side : make the dressing as bulky and put it as high up the axilla as you can. There will not then be the tendency to cramp and pain after the operation, neither will there be the tendency to fixation of the arm subsequently. I let all my patients who have had an



operation for cancer of the breast move the arm freely at the end of 48 hours. I like them to feed themselves, I prefer that they should use the arm for the purpose of writing letters, and so on. It is, I am sure, good to leave these arms as unfettered as possible, and by this means all the subsequent stiffness and trouble which ensue in so many cases may be entirely avoided.

Now one word as to results. Patients naturally want you to tell them, as nearly as you can, what is going to be the result of your treatment. You advise an operation, and the patient naturally asks if you can cure her. The answer to that will depend on an infinite number of things. It will depend, first of all, on the nature of the tumour. I have told you that these acute inflammatory carcinomas of the breast are, in my opinion, never cured: those tumours, I mean, associated with œdema and reddening of the skin, with all the appearances of acute inflammation. I have never yet been able to apply the term "cured" to one of these cases, nor do I know of other people having cured them. The last case of this kind I saw last summer, in the person of a lady who had recently had what was supposed to be inflammation of the breast. She had a huge swelling of the breast, with œdema of the skin, redness, and a lump of considerable size in the other breast. The axillary glands were not particularly involved, but there was such a large area of skin affected that I did not think there was any good to be obtained by operation. Yet operation, I learnt subsequently, was done by somebody else, and both breasts were taken away, and within two months of that time the patient was dead from infiltration of the viscera with cancer. In these cases, I say, you cannot promise very much good by operation at all. But in the more common scirrhus cancer, where the case is fortunately seen early, where the skin is not materially involved, where the patient and the doctor have not waited for the appearance of these characteristic conditions and evidences of carcinoma—namely, the enlargement of glands to a considerable extent, fixation of the tumour, and pain—then, in a considerable proportion of cases, you may bring about a cure. In what proportion can that be done? Roughly speaking, as far as statistics can tell us, in about half

the cases, if they are seen early enough. The next important thing is to tell the patient that, after getting over the operation, she ought to come and see you every three months. After you have seen her regularly for two or three years, you can say she need not now come so often, but had better still be seen every six months. By seeing people frequently you will often be able to detect a small recurrence long before the patient is aware of it, and then by means of a correspondingly small operation you may nip the recurrence in the bud and prevent it extending. I remember a patient of my own whom I saw fifteen months after removal of her breast, with a tiny lump no bigger than a pea. I removed it. That is six years ago and she is still free from further recurrence.

After what period can you say there is cure if in such and such a time there has been no recurrence? I do not know that anybody can ever say for certain that any case is cured, but of many you can speak in very encouraging terms. There is a fallacious idea concerning a period of three years in this matter. You hear people say that there has been a cure of a case of cancer because there has been no recurrence for three years. I wish it were true. It is not true. I have seen patients have recurrence four years, five years, six years, seven years after the first operation. And in one case, in which the operation was done by Sir Thomas Smith and in which I did the second operation twenty-four years afterwards, the patient died from dissemination of recurrent cancer in the 25th year after the primary growth had been removed, although she had had no signs of cancer being present at all for twenty-four years. I have also seen a patient whose breast was removed without removing also the axillary glands, and in whom seven years elapsed before she came back to the hospital with a lump in the axilla, due to an enlarged mass of axillary glands; there was no local recurrence in the mammary region, and one knew that the tumour must have sown its seeds in those axillary glands seven years before they sprouted. What had happened in the interval? That is one of the curious things which take place in connection with carcinoma. Carcinoma may lie dormant—as those cells must have lain dormant—and nothing may happen for a long time. Why there should then be a sudden reawakening of them, so

that then they begin to grow, is a question we are not yet in a position to answer. Yet sometimes operation seems to act in an inhibitory way. Some of you may remember a patient who was in the hospital three years ago. Upon her I operated for removal of a fungating cancer of the breast. I only operated upon it because it was bleeding and was very foul and very distressing to the patient. I knew I could not remove all the disease, and, therefore, my procedure was intended to be merely palliative, and I could not take away the diseased glands above the clavicle. But the patient got very much better, and went out of the hospital. Two years afterwards she came back with a small recurrence in the scar of the operation. All the cancerous glands that I knew I had left on the former occasion had shrunk up and disappeared, and there was far less disease when I saw her at the end of those two years than when I discharged her from the hospital. That will show you how difficult it is to speak dogmatically. One thing I am quite clear about, and that is that the three years' limit which is spoken of is purely an ideal: there is no charm about three years any more than there is about two or about four years. Therefore it is not advisable to let these cancer patients pass permanently out of your sight. And if you keep them under observation at regular periods you will often be in a position to remove an early recurrence by a small operation, whereas but for that it would have extended to such a degree as to be irremovable.





## REVIEW OF DISEASES OF THE BLOOD.

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IN former reviews, the attempt has been made to give an account of the advances made in the pathology and treatment of diseases of the blood (THE PRACTITIONER, February and March, 1908), so far as its corpuscular elements were concerned. Recently, the special interest in the study of the blood has turned rather upon the consideration of certain bio-chemical reactions of the serum. The investigations carried out with this object have been so prolific of practical gain and the principles on which they are based are so important, that the time has come for the general practitioner to make himself familiar with these investigations. The one great hindrance to this step, however, is that the newer investigations are quite unintelligible, unless the reader is conversant with a terminology which is a modern development and which it is absolutely necessary should be learnt in order to understand the meaning of the newer investigations in this direction. No doubt even now to many the elaborate terms introduced as a result of the investigations in cellular pathology, investigations which are largely due to Virchow's genius, are only partially known and, indeed, are not necessary to the general practitioner, even though he showed a willingness to follow up the advances made in cellular pathology.

Humoral pathology in its turn has now received a great impetus, and with the advance in knowledge in this direction, many terms have been coined to express certain agents and effects of their activity utterly unknown a few years ago. It is, however, unnecessary to give a sketch of all these agents and processes, but in this review an attempt will be made to put before the reader just so many of them which are necessary for a due understanding of the phenomena of immunity, and which have been applied to unravel clinical difficulties.

*Agents and Reactions.*—Pathology in the past has given us a careful study of all the cellular changes which may be

brought about when foreign substances of definite chemical composition are introduced into the body, *e.g.*, we are familiar with the effects of poisoning by alkalies, acids and alkaloids, by metals and their salts, by alcohol, chloroform, etc. This acquisition of knowledge was followed by a histological and clinical inquiry into the effects produced when pathogenic bacteria and their derivatives gained access to the body; the fatty degeneration and fibrous-tissue reaction produced in tuberculosis, the ulceration of the intestines in typhoid fever and dysentery and the croupous formation in pneumonia are matters of common knowledge. But the changes brought about in the fluids of the body—changes, for example, in the serum of the blood, cerebro-spinal fluid and other secretions resulting from the introduction of agents such as the derivatives of bacteria, of snake venom, of proteids derived from foreign animal or vegetable cells—all substances which by reason of their character cannot be subjected to chemical analysis and so be given a formula, have been quite unfathomed. Chemical, physical, and microscopic examination failed to show changes in the serum which could be made of practical use in diagnosis. This state of affairs is now altered, but, as already hinted, to follow the investigations, a new language and new ideas must first be learnt.

*Antigens.*—This is a generic term used to indicate all agents of an organic character which when introduced into the body do not pass simply through the body, neither altering it nor being unaltered, but leave a mark in that they lead to the development within the serum, etc. of substances which are quite new and maybe are so inimical to the animal into which they are introduced as to lead to molecular and molar death. The antigens include a variety of agents.

#### I.—BACTERIA.

The organisms which on entrance into the body produce harmful effects are spoken of as pathogenic bacteria. They may poison the body by means of substances resident within their bodies—endotoxins, as, *e.g.*, in the case of the typhoid organism—or they may poison the body by their extra-cellular, or secretive emanations, as in the case of the diphtheritic organism. The bacterial antigens may then be intra- or extra-cellular poisons. So far as we know at present they

may in time provoke the formation (on entrance into the body) of certain harmful substances, which may be grouped thus:—

(a) Toxinogens, which yield toxins, and these in turn lead to the damage of certain cells of the body—*e.g.*, the tetanus bacillus yields a body which has a selective poisoning affinity for nerve cells.

(b) Agglutinogens, which on entrance into the body lead to the formation of agglutinins, *e.g.*, the agglutinogens of the typhoid bacillus and micrococcus melitensis.

(c) Precipitinogens which lead to the formation of precipitins, *e.g.*, the precipitinogens of various bacteria.

(d) Lysinogens, which exist in bacteria and on introduction into the body lead to the formation of lysins which may have the effect of loosening and destroying, not only the cells of the body, but also of the very bacteria which gave rise to them. Such lysinogens may give rise to one or more lysins. A bacterial invasion of the body may be followed not only by dissolution of bacteria, of organ cells, *e.g.*, of the kidney or heart, but also of red corpuscles; thus we may expect bacteriolysinogens and cytolysinogens such as hæmolysinogens, nephrolysinogens, etc.

(e) Opsoninogens which give rise to opsonins, a term with which we are already particularly familiar in this country.

(f) Aggressinogens, or bacterial derivatives, which attack the leucocytes and paralyse their power of protecting the body.

The groups (a), (b), (c), (d), (e), and (f) are clearly separated, and it is possible that further research will show the existence of other antigens whose activity has not yet been recognised.

*Antibodies.*—There are the so-called immune agents produced in the body of the infected animal as a result of the introduction of the various bacterial antigens just named. They are supposed to be defensive reactions; this is clear in the case of antitoxins and bacteriolysins, but at the present moment it can hardly be said that they are all defensive, *e.g.*, it is not clear that the development of agglutinins, of precipitins, of hæmo- and other cytolysins is defensive.

These bodies would fall under the following classification:—

(a) Antitoxins.

(b) Agglutinins.



(c) Precipitins.

(d) Lysins, including bacteriolysins, cytolytins (a familiar one being hæmolysin which dissolves red corpuscles).

(e) Opsonins.

(f) Antiaggressins.

These antibodies are produced from the cells of the body, but from which ones is not yet clear, and they may be looked upon as *figurative* arms or processes of certain cells of the body which have been liberated and then circulate in the fluids of the body. These loosened and free processes are spoken of as "receptors," to use a word which looms largely in Ehrlich's hypothesis of the "side chain theory," and they have the power of combining with the substance which gave rise to their liberation and then their harmful effect is neutralised, the antitoxin of diphtheria combining with the toxin and leaving the individual little the worse for his infection. Agglutinins and precipitins constitute a different form of receptor, a more complicated one, and the effect is expressed in a special way; the former not only attaches itself to the antigen which provoked it, but, as in the case of the typhoid organism, it so alters the latter that the individual bacteria adhere to one another. Precipitins, too, have a special effect in that, if they are added to a fine watery emulsion of the antigen giving rise to them, they soon cause the formation of small flocculi which are precipitated to the bottom of the emulsion. Then, again, a lysin is complex in that it consists of a receptor of another special type,—a receptor, in fact, which is capable of attaching to itself, as it were, at one of its ends, the antigen giving rise to it, and at the other end it is capable of entering into union with a body not yet mentioned which is present in all animals quite apart from their being infected. This substance is known by various names—complement, cytase or alexine, the first-named term being the one most constantly used.

The special receptor which possesses this character of being able to combine on the one hand with the antigen giving rise to it, in this case a bacterium, and by the other end with the complement is spoken of as an "amboceptor" (*i.e.*, ambo-receptor), or sometimes but less frequently as an immune body. The reader is liable at this stage to be confused by the concep-

tions referred to, but he must further realise that probably all living animals are naturally possessed with a varying amount of complement and of "natural" amboceptors, and that when bacteria gain access to their bodies more amboceptors form, which, however, are special in type in that they have a special affinity for the bacteria giving rise to them. When complement and amboceptor are combined they form a combination which has already been spoken of as "lysin," and if they can operate against bacteria in this conjunction they constitute "bacteriolysins."

Complement is thermostabile, *i.e.*, it is readily destroyed by heating for half an hour at a temperature between 55° and 60° C. Serum so treated is said to be "inactivated," because any lysin previously present in it is now no longer capable of exerting its lytic action; it no longer contains the active combination, complement + amboceptor, but only amboceptor, which is thermostabile and unaltered by the heating above mentioned. If native or active, *i.e.*, unheated serum, is added to inactivated serum, the latter is said to be "activated," *i.e.*, it is again supplied with a certain amount of complement.

Complement possesses still another peculiarity. It is, according to Bordet, very catholic in its power of combining with amboceptors. The same complement can combine with many different amboceptors produced by the introduction of antigens derived from quite different sources, as, for example, from bacteria or from animal cells. The complement, which at one time combines with the amboceptor produced by the introduction of bacteria into an animal's body, is quite capable when not so engaged of combining with the amboceptor produced by the introduction into an animal of the red corpuscles of some different species. In both cases it is the complement which acts as the ultimate executive—it brings about the lysis or solution of the antigen. It is helpful at this stage to make use of the scheme suggested by Fischer to explain the relation of antigen, amboceptor, and complement. He makes an analogy with the action of a lock, the key with which it is turned and the hand which turns it (Fig. 1).

The comparison is a very apt one, because the muscles of the hand representing the lytic activity of the complement can be used to turn different keys in as many different locks,

and the same fingers can be used to grasp the handles of quite differently shaped keys, *i.e.*, the complement can combine with amboceptors derived from quite different antigen sources. Further, it may be supposed the key is a master key and

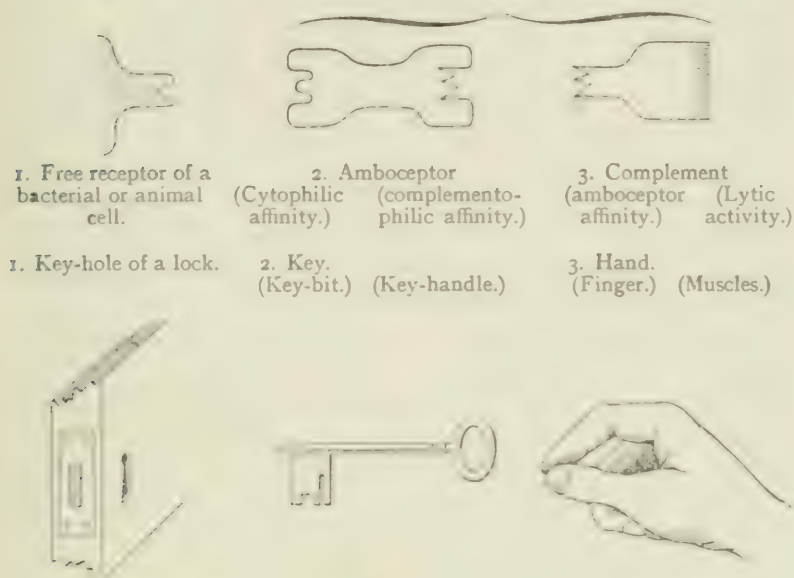


Fig. 1.

the key-bit opens not one but several locks. This latter part of the analogy requires expansion. It has already been stated that a given antigen may give rise to an amboceptor, but experiment has shown that the amboceptor is not rigorously limited in its activity towards the antigen which gave rise to it, it may fit several antigens which happen to have receptors which will fit, in other words, the principle must be accepted that the cytophilic affinity of amboceptors is not absolutely specific for certain cells, but is absolutely specific for certain types of receptors which the cells are possessed. The master key is not able to pass the wards of any one lock, and several locks may possess different wards all of which are surmounted by the master key.

## 2.—ANIMAL CELLS, ANIMAL EXTRACTS OR FLUIDS ; VEGETABLE CELLS AND EXTRACTS.

Antigens are not restricted to bacteria. If emulsions of animal cells, such as the cells of various organs, red corpuscles



or animal fluids, as the serum of the blood, or animal proteids, such as can be separated from them, or animal secretions such as snake venom, or vegetable products such as ricin and abrin, be injected into animals, antibodies may be produced. But a reservation must be made, because it is necessary to state that when animal derivatives are injected into other animals, the two animals must not be identical or antibodies will not be produced. Antibodies may be produced when the red corpuscles of a sheep are injected into a rabbit, hæmolytins being produced. It is not, however, so easy to demonstrate that when the cells of an organ, say, of one rabbit, are injected into the blood stream or peritoneal cavity of another rabbit, that the latter animal develops anti-bodies. Ehrlich has propounded an axiom that auto-intoxication is impossible, that a veritable "horror autotoxicus" exists. The mechanism of this defence consists in (1) that the animal into which such homologous antigens are injected, absorbs them as foods, or (2) that it develops antiamboceptors which nullify the amboceptors formed.

With this one reservation, however, the development of antibodies after the introduction of this second class of antigens is on all fours with that brought about when bacterial antigens are introduced.

Protozoological studies have shown us that animals, including man, may be invaded by another form of antigen, viz., by the spirochaete of syphilis or the trypanosome of sleeping sickness. Even these new arrivals on the pathological platform seem able to produce antibodies, but it must be remembered that, like certain bacteria, such as the leprosy bacillus, they cannot be cultivated outside the living body: they can be transmitted in a living condition from one host to another under natural conditions, and experimentally the organs of one animal so infected may be emulsified and injected into another: in both cases antibodies are formed.

*The Bordet-Gengou Reaction* (*Annales de l'Institut Pasteur*, 1901. T. XV., p. 289).—With the conceptions above referred to, it is possible to consider the details of the Bordet-Gengou reaction—a play of cause and effect—and the demonstration of the latter by means of biochemical reactions, which, like the related phenomena illustrated in the Gruber-Durham or Grünbaum-Widal agglutination-reaction used in the diagnosis of typhoid

fever, have revolutionised clinical medicine, clearing up problems which were insurmountable and preparing the way for other investigations the value of which it is impossible to over-estimate.

These two workers conceived a plan by which it has become possible to turn cytolytic studies to clinical account in the investigation of certain bacterial infections. The possibility of such a procedure turns upon the fact already referred to, that complement may not only be engaged with the complementophile affinity of an amboceptor developed as the result of a bacterial infection, but also with the complementophile affinity of an amboceptor developed as the result of immunising one animal with the red corpuscles of an animal of a different species, and that when once it is so engaged with the former it cannot be disengaged when the latter is subsequently brought into proximity with it. The complement is as it were "anchored" or "fixed" to the former, and that this is so is shown by the absence of hæmolysis, which if present would show that the complement was fixed by the hæmolytic amboceptor. To refer this phenomenon to the analogy suggested by Fischer, it may be said that if the hand, fingers, and muscles are engaged in inserting and turning the key in the lock, the same hand, fingers, and muscles could not be simultaneously occupied in turning a different key in another lock.

The Bordet-Gengou reaction is carried out in a test tube and consists in bringing into juxtaposition five elements, first three of them and finally adding to these three two others.

The five elements of the reaction:—

(1) Typhoid organisms are made into an emulsion with sterilised distilled water, and the emulsion is thoroughly shaken for 24 to 48 hours; to kill all living typhoid organism that may remain, the emulsion is heated for 24 hours at 60° C. It is then centrifugalised till the supernatant fluid is quite clear and free from bacteria. This clear solution constitutes the antigen.

(2) Fluid is withdrawn from the spinal canal, pleural or peritoneal cavity, or the serum is obtained from the blood of a patient who is suffering from typhoid fever. Whichever fluid is used is heated for half an hour at a temperature of 55° to 60° C. This procedure destroys the complement, leaving the

amboceptor free in the fluid. This constitutes the typhoid amboceptor.

(3) A normal guinea-pig is bled, its blood whipped or allowed to clot and the serum pipetted off. The guinea-pig is chosen because its blood is particularly rich in complement.

(4) A rabbit is immunised with the red corpuscles of another animal, say, the sheep. In order to do this, the sheep's corpuscles are obtained by whipping freshly-drawn blood and then centrifugalising so as to separate the serum and red corpuscles: the former is pipetted off and the corpuscles are subjected to three washings with normal saline solution, each washing being followed by centrifugalisation and the removal of the supernatant fluid by pipetting. Five cubic centimetres of these corpuscles are then injected into the peritoneal cavity of a rabbit at intervals of 5 to 7 days, the injection being repeated 3 or 4 times. The rabbit is then bled 7 to 8 days after the last injection. The blood is whipped and the serum pipetted off: it will be loaded with hæmolytic amboceptors capable of hæmolyzing the red corpuscles of a sheep. It is, however, necessary now to test the strength or *titre* of of this hæmolytic serum. To do this the serum is first heated for half an hour at 55° to 60° C. in order to destroy any complement which exists naturally in the rabbit's serum. Various dilutions of this serum are then mixed with diluted guinea-pig serum and with a 5 per cent. emulsion in salt solution of the washed red corpuscles of the sheep. The tubes containing these mixtures are then heated in an incubator at 37° and observations are made, occasionally shaking the mixture, to see what is the highest dilution of the hæmolytic serum which is capable of just completely laking all the red corpuscles contained in a cubic centimetre of the emulsion of sheep's corpuscles in salt solution. The highest dilution is then spoken of as the *titre*, and may be 1 in 400 to 1 in 1,000, which are good working strengths of hæmolytic serum. For the purposes of the Bordet-Gengou reaction a sufficient quantity of solution of the hæmolytic serum is now prepared, which is double the strength of the *titre*, say, 1 in 200 to 1 in 500.

(5) The fifth and last element is the 5 per cent. suspension of sheep's corpuscles in salt solution.



Each of the five elements is made up to 1 cubic centimetre of salt solution.

*Procedure.*—A. The first three elements are now placed in a dry sterile test tube and may be represented thus (Fig. 2); the dilution of the complement and of the typhoid serum and the strength of the typhoid emulsion are not indicated.

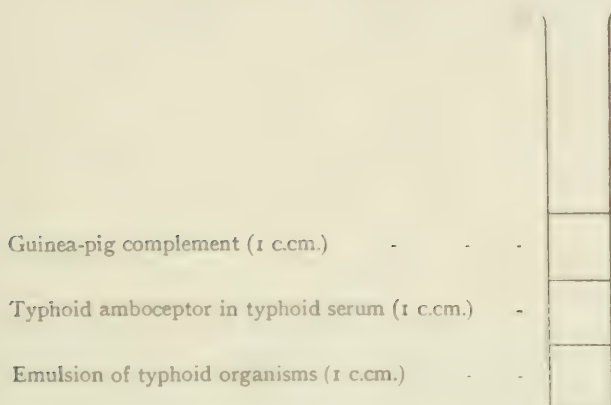


Fig. 2.

The three elements are well shaken up and are then placed in an incubator at  $37^{\circ}$  for one hour, and at the end of this time the complement will have been united firmly to the complementophile affinity of the typhoid amboceptor, and the cytophile affinity of the latter to the antigen, here represented by the emulsion of typhoid organisms. Such union is biochemically a very stable one; and it would be impossible to break up the combination except by heating the mixture to  $55^{\circ}$  to  $60^{\circ}$  for half an hour.

B. — The next stage consists in adding to the above mixture 1 c.cm. of 1 in 400 dilution of the hæmolytic serum; and 1 c.cm. of the 5 per cent. suspension of sheep's red corpuscles. All five elements are now well shaken and a red opaque fluid results. Fig. 3 shows the five elements brought into juxtaposition. The tube is then exposed for a period something under two hours in an incubator at  $37^{\circ}$  C., and afterwards the tube is allowed to stand at the temperature of the laboratory. The red corpuscles will be found to sink

to the bottom of the tube and to have undergone no hæmolysis, as the supernatant fluid will be quite colourless.

|                    |   |   |   |   |   |   |   |   |  |
|--------------------|---|---|---|---|---|---|---|---|--|
|                    |   |   |   |   |   |   |   |   |  |
| Red corpuscles     | - | - | - | - | - | - | - | - |  |
| Hæmolytic serum    | - | - | - | - | - | - | - | - |  |
| Complement         | - | - | - | - | - | - | - | - |  |
| Typhoid amboceptor | - | - | - | - | - | - | - | - |  |
| Antigen            | - | - | - | - | - | - | - | - |  |

Fig. 3.

A control is made by preparing another tube, replacing the serum of the typhoid patient by that of a normal individual. The same incubation is carried out and it will be then noticed that the red corpuscles are completely laked and appear to be destroyed, the whole tube being now filled with a transparent red solution. In this case hæmolysis has been complete because the complement unanchored to the typhoid amboceptor and typhoid antigen is free to fix itself to the hæmolytic serum and red corpuscles thus constituting a "hæmolytic system," which has shown its existence by complete hæmolysis of the red corpuscles. Any other serum or fluid suspected to contain typhoid amboceptor may now be tested, and a return be made of its typhoid or non-typhoidal character according as the hæmolysis has not or has occurred.

No doubt the Gruber-Durham (Widal) test is a much simpler method than the above, but the principle involved in the Bordet-Gengou reaction is of far greater importance, for it is applicable to the testing of the sera of differently infected patients, the organism causing the infection not being one in which agglutination (upon which the Widal test depends) occurs.

In order to make clear the details of the Bordet-Gengou reaction, a scheme is reprinted (Fig. 4) borrowed from a chapter

written by Julius Citron in Brugsch and Schittenhelm's *Lehrbuch klinischen Untersuchungsmethoden* (Urban und Schwarzenberg, Berlin und Vienna, 1908).

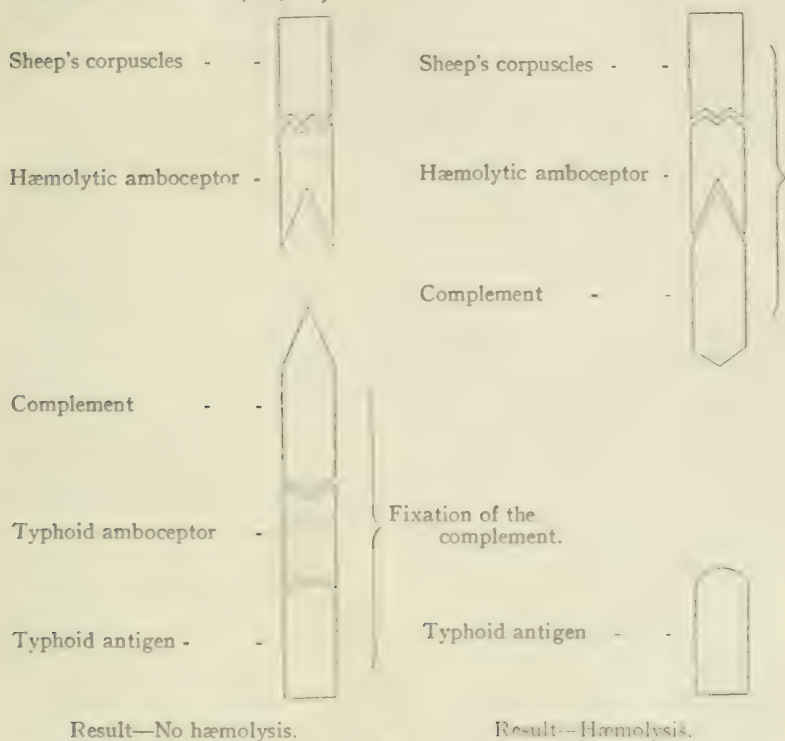


Fig. 4.

Complicated as the carrying out of this reaction may appear to be to the reader, he must not think that the above sketch in any way places before him all the details of this test. It is necessary to grade the strengths of the antigen, and of the dilution of typhoid amboceptor; moreover, the tests must be carried out with strict asepsis, and cold storage or desiccation of complement and sera with subsequent re-solution will be necessary.

The reader will further observe that, ingenious as this test appears to be, the simplicity of the agglutination test for typhoid injection renders the latter a far more useful test. This is quite true, and it is no purpose of the reviewer to endeavour to upset this belief. The principle of the Bordet-Gengou reaction, however, is so important for medicine that



its broad details must be mastered in order that the developments may be appreciated which have taken place since the publication of the reaction.

It is further important to remind the reader again that the agglutination test is only applicable in the case of organisms which provoke the formation of the special antibodies—agglutinins. All pathogenic organisms do not do this, and yet produce other antibodies, the existence of which in the individual under examination would be detected by the Bordet-Gengou reaction, and missed by the agglutination test. No doubt opsonic estimations seem to detect the existence of this or that infection and are applicable in all cases of bacterial infection, *provided that the particular organism in question can be cultivated outside the body*. Some organisms, however, resist such cultivation, *e.g.*, the lepra-bacillus and the newer protozoal infections; the trypanosomiasis are caused by agents which also are incapable of cultivation except in the living body, so that these infections, including syphilis, do not lend themselves to the agglutination tests, nor to the tests described by Sir Almroth Wright.

At a late stage in this review, the reader at last is brought to its true purpose, namely, to put before him the work done in the direction of applying the Bordet-Gengou reaction to the detection of syphilis, leprosy, and other infections. The whole of this investigation has followed upon the ingenious application of the Bordet-Gengou reaction by Wassermann, and it is known as "Wassermann's sero-diagnosis of syphilis," or the "diagnosis of syphilis by fixation of the complement."

No purpose would be served in giving in this review all the details of this reaction as developed by Wassermann, but the criticism of the principles involved will be passed in review, so that the reader may be acquainted with the corrections which have been suggested, as well as with extensions of the test to kindred infections.

The adaptation by Wassermann of the Bordet-Gengou reaction to the detection of syphilis consists, in brief, in the substitution of the typhoid or other cultivatable bacterial antigen by the tissues of a syphilitic foetus, the liver or spleen being especially used for this purpose. The antigen is the spirochæte pallida, which is entrapped in the interstices of the

organs mentioned. The organ is desiccated, ground to a powder, and used as a solution made with normal saline. The syphilitic amboceptor is of course in the serum obtained by withdrawing a little blood from a patient suffering from syphilis, not only in the primary, secondary or tertiary stages, but in those later stages which have been described by Fournier as the parasyphilides, e.g., tabes, tabo-paresis, and general paralysis. Wassermann's sero-diagnosis shows the existence in infected patients, in all stages, of a definite amboceptor provoked by the entrance into the system of the spirochæte pallida. Pathology has been enriched by this discovery and practical medicine illuminated most remarkably; even the therapeutics of syphilis has gained by the acquisition of a means of telling when our patients are ridded of the syphilitic infection as a result of mercurial and other treatment, with probably the solid result, that less people will in future be candidates for the degradation of the central nervous system known to us as tabes dorsalis, etc.

The remaining elements of the test are of the same order as those described by Bordet and Gengou—complement hæmolytic serum and red corpuscles—in fact, the complete "hæmolytic system."

It is not to be wondered at that such an investigation should have provoked much work as a sequel.

The first paper on the diagnosis of syphilis by means of the method of fixation of the complement was published by Wassermann, Neisser and Bruch (*Deutsche med. Woch.*, 1906, No. 19, s. 745). They showed that the serum of monkeys which had been inoculated with syphilitic virus revealed the presence of amboceptors capable of combining with preparations containing the spirochæte of syphilis. In the 44th number of the same publication (s. 1,769) Wassermann and Plaut showed that the cerebro-spinal fluid of patients suffering from general paralysis also contained similar amboceptors, and they also showed that only tissues infected with the syphilitic organism and none other gave the reaction with the serum of infected monkeys; the controls made with the tissues of non-syphilitic fœtuses failed to show the reaction (Wassermann, Neisser, Bruch and Schucht, *Zeitsch. f. Hyg. u. Infektionskr.*, 1906, s. 451). A number of workers followed with results which

confirmed their views, but it was soon found that objections could be raised both against the theoretical conceptions on which the test was based as also against the alleged practical results, and foremost amongst these objectors were Kraus and Volk (*Wiener klin. Woch.*, 1907, No. 17, s. 515), who stated that not only the sera of syphilitic subjects but also the sera of non-syphilitic cases showed the power of preventing hæmolysis in the Bordet-Gengou scheme, the antigen being the tissues of syphilitic or non-syphilitic fetuses. Weil also (*Wiener klin. Woch.*, 1907, No. 18, s. 527) was able to support Kraus's contention that non-syphilitic tissues reacted with syphilitic sera and considered it probable that non-syphilitic sera would also react similarly.

A third school of workers completely confirmed Wassermann's views, but also showed that the serum of syphilitic subjects and the cerebro-spinal fluid of cases of general paralysis reacted not only with syphilitic tissues but with extracts of normal tissues; a normal liver reacted as well as a syphilitic one if it were used in larger quantities. Extracts of condylomata were as efficient. There seems, therefore, reason to believe that the amboceptor is present as alleged in syphilitic sera, but that an antigen capable of bringing about the fixation of the complement is present in syphilitic and in non-syphilitic tissues, and efforts have been directed by various workers to establish the element which acts as antigen. Simultaneously Porges and Meier (*see* Wassermann, *Berlin klin. Woch.*, 1907, Nos. 501 and 521, s. 1598, s. 1634, and Landsteiner, Müller, Pötzl (*Wiener klin. Woch.*, 1907, No. 50, s. 1564) showed that this specific element could be extracted from syphilitic and non-syphilitic organs by means of alcohol, and was probably of a lipoid character. Porges and Meier believed this substance to be lecithin, but Landsteiner, Müller and Pötzl gave reasons for doubting this. Levaditi and Yamanouchi found (*Compt. Rend. Soc. Biolog.*, 1907, p. 740) that bile acids gave a similar reaction with the serum of syphilitic tissues. Porges has also described a method much simpler in formula than the Bordet-Gengou reaction, based upon the view that lecithin is the specific body, for he finds that the serum of syphilitic patients gives a precipitation with glycocholate of sodium.

The preparation of the alcoholic extract of non-syphilitic

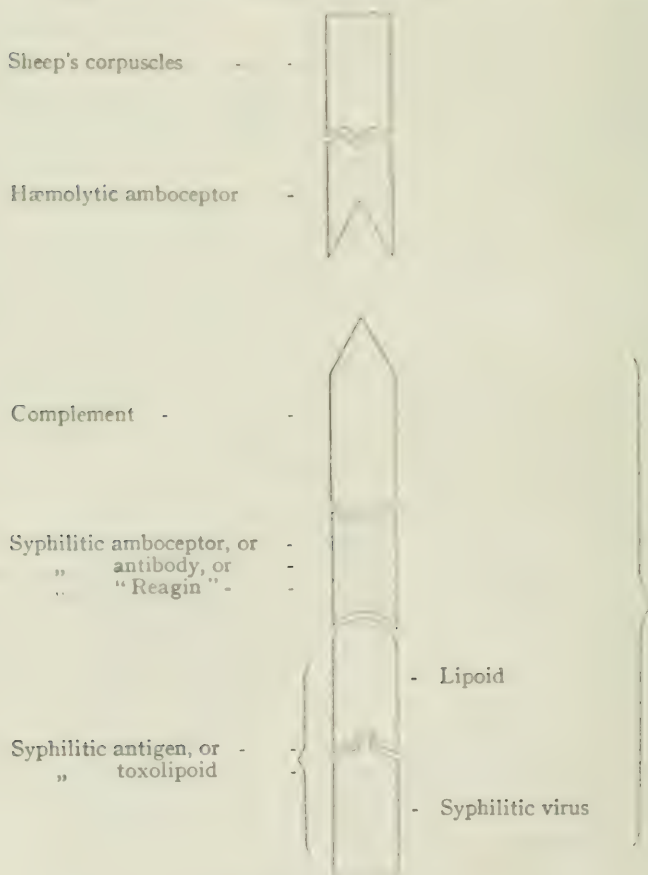


organs which is capable of acting as a suitable antigen for syphilitic serum is described by Müller (*Wiener klin. Woch.*, 1908, No. 9, s. 284). One gramme of the heart muscle of a guinea-pig is rubbed up with fine sand, and 50 c.cm. of 95 per cent. alcohol are added; the whole is well shaken, and allowed to stand 2 hours at 60° C., being shaken again during this interval; the preparation is then filtered, and the filtrate kept at the room temperature for use. Müller investigated 197 cases, and all were clearly positive, except four completely negative cases—two of which showed an initial swelling of inguinal glands, another case showed an ulcer on the upper lip, which failed to react to mercurial treatment of a year's duration, and a fourth which showed recurrence of a diffuse rash after an initial treatment with injection of mercury; six of the 197 cases only gave a weak development of hæmolysis, and therefore in these six cases a certain positive or negative diagnosis could not be made.

A perusal of some of the numerous papers published on the value of this means of diagnosis of syphilis shows that its clinical value is established, but when an attempt is made to find a scientific explanation, the greatest difficulty is experienced to find any unanimity; the controversy has already assumed voluminous proportions, and the unwary reader is tempted to feel that the test itself must be a doubtful one in view of the differences of opinion which exist as to the details of its explanation. For the benefit of the reader, it must be confessed that it is true that actual syphilitic antibodies have not been clearly defined in syphilitic patients, further that the antigen present in normal and in syphilitic organs has not been demonstrated to be solely a derivative of the syphilitic virus, but that at any rate the substances present in syphilitic tissues, and extractable easily by means of water and less so by alcohol, are more abundant and give a more marked and more indubitable reaction than do similar bodies derived from normal tissues; in other words, that the reaction, as in so many biological tests, is only quantitatively specific.

Citron (*Berlin. klin. Woch.*, 1908, No. 10, s. 18), in endeavouring to give a working hypothesis for the reaction, believes that the amboceptor present in syphilitic subjects possesses a complementophile affinity, but that its other affinity is some-

what complex in that it is not merely cytophilic for spirochaetes present in syphilitic organs, but is lipoidophile. It can therefore combine not only with the lipoid substances present in normal organs to a certain extent, but it can also combine, and much more effectively, with syphilitic antigen, which contains a complex consisting of the syphilitic virus combined with lipoid substance present in the organ (liver, spleen, etc.) in which such virus is located. Seeing that an amboceptor of such a curious character as this has hitherto not been demonstrated, Citron prefers to speak of this hypothetical amboceptor under the new title of "Reagin," and describes the antigen as "toxolipoid."



Result—No hæmolysis.

Fig. 5.

Fig. 5 is an adaptation of Citron's view of the way in which the Wassermann's reaction is brought about (failure of hæmolysis), when the test is applied on the plan of the Bordet-Gengou test for typhoid fever (*see* Fig. 4).

*Other Applications of the Bordet-Gengou Reaction.*—As already stated, this reaction has been used in the investigation of other conditions in which a foreign element has on gaining access to the body produced changes in the serum.

Citron, in an able article on the Bordet-Gengou reaction in the *Handbuch der Technik und Methodik der Immunitätsforschung*, edited by Kraus and Levaditi, Bd. II., Zweite Lieferung, s. 1076, has summarised the applications of the test in—

1. The diagnosis of infections in which the infective agent is known and can be cultivated.

(a) The test has been successful in some cases of epidemic cerebrospinal meningitis.

(b) Successful in some cases of tuberculosis not treated with tuberculin.

(c) Successful in some cases of gonorrhœal infection.

(d) Successful in cases of typhoid fever. The infection was also found to be present when the agglutination test failed.

(e) Successful in infection with swine-fever and paratyphus bacillus.

2. The diagnosis of infections, in which the infective agent is problematical or cannot be cultivated.

(i) Syphilis.—Although it is so widely accepted now that the spirochæte pallida is the actual cause of syphilis, yet the difficulties arising out of the investigation of the Wassermann reaction and the fact that the spirochæte cannot be cultivated, induced Citron to place this infection by itself, the antigen being looked upon as a composite body, to which Citron has given the name of toxolipoid.

(ii) Infections caused by known agents which cannot, however, be cultivated.

(a) Rabbits injected with the blood and extracts of organs of rats infected with trypanosomes produced a serum which gave the reaction with the blood and organs of infected guinea-pigs used as antigen.

(b) The reaction was given in patients suffering from



recurrent fever.

(c) The serum of patients and animals suffering from hydatid disease, gave the reaction with extracts of the parasite as well as with hydatid fluid.

(iii) Infections caused by unknown infective agents:—

(a) In some experimental animals the reaction was positive when the animals had been vaccinated, vaccine pustules being used as antigen.

(b) Rabbits injected with extracts of organs derived from small-pox yielded a serum which gave positive reactions when the lymph of cow-pox was used as antigen.

(c) The serum of patients suffering from scarlet fever gave the reaction when the antigen used was an extract of the liver of children dying of scarlet fever.

Finally, the Bordet-Gengou reaction has been turned to practical use in forensic investigation, for by its means it is possible to establish the development of antibodies in the serum of animals which have been injected with various proteins, thereby confirming and extending the means by which various protein bodies may be differentiated by biological tests other than the "precipitation" methods.

Such is a brief account of the technique and applicability of the Bordet-Gengou test to the investigation of disease. No doubt the details exact much attention and considerable time, so that none but experts can assume the responsibility of applying the test accurately. But these difficulties are not insuperable and the gain to practical medicine has already been great and still more is promised in the future. In view of the stationary character of the investigations in the morphology of the red and white corpuscles of the blood, these later humoral investigations have come as an encouraging and suggestive contribution to practical medicine.



## THE SERUM DIAGNOSIS OF SYPHILIS.

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OF the recent advances in medicine, none claim to be of so much importance as the serum diagnosis of syphilis, a test based upon what is generally known as the Bordet-Gengou reaction. This reaction is a binding of the complement which takes place when an antigen meets with its homologous inactive immune serum, and can be shown as follows:—On the further addition of a serum, erythrocytes, and hæmolytic serum, (inactivated in order to rob it of its complement) no hæmolysis can occur, if the complement has become bound, because the hæmolysin has no free complement. With a known antigen one can find out by this method its homologous amboceptor and vice versâ. To give a practical picture. We have a serum of a supposed typhoid. To the antigen (typhoid bacilli) one adds the serum under question, which has been inactivated at 56° C.; since by this process it has lost its complement, one adds normal guinea-pig's serum. The mixture is put into an incubator for one hour. Then the erythrocytes and hæmolysin are added. Two things are possible,—Either it is a case of typhoid and the serum holds the typhoid amboceptor, which can bind itself with the typhoid antigen and thereby fix the complement, so that no hæmolysis can occur; or a hæmolysis occurs because there is no specific amboceptor present; therefore the suspected serum is not from a case of typhoid.

Later Wassermann and Bruch found that a positive Bordet-Gengou reaction could be obtained by the bringing together of bacterial extracts and immune serum. Further experiments by the same authors proved that extracts of organs behaved as the antigen, and then Wassermann, Neisser, and Bruch showed that in the serum of apes which had been treated with syphilitic extracts, substances appeared which brought about a fixation of the complement. The final result was that Detre, Wassermann, Neisser, Bruch, and Schucht found the same substances in the serum of human syphili-

tics. One can see how important this work of Wassermann's was, since, owing to the inability of cultivating the spirochæta pallida, the original Bordet-Gengou reaction was inapplicable.

(1) *Antigen*.—Obtain either the liver or spleen of an hereditary syphilitic fœtus. Cut the organ up into small pieces and add to it a  $\frac{1}{2}$  per cent. solution of Acidum Carbolicum in physiological saline solution, in the proportions of 1:4. Centrifugalise for 24 hours and collect the clear fluid. The antigen should not be used until eight days have elapsed since its preparation, because it is only then that the strength becomes constant. The extract should be kept in an ice cabinet (not allowed to freeze) and in brown flasks. After standing a precipitate forms, so be careful to pipette off the clear fluid above before use. 0.2 ccm. should be taken for the reaction. Regarding the quantity of antigen to be used as a general rule one can state that only so much should be used the double dose of which is unable to fix the complement.

(2) *Antiserum*.—The blood can either be taken from a vein in the forearm or from the finger tips; in sucklings and young children the inner side of the heel is the best place. Put in an incubator for  $\frac{1}{2}$ —1 hour at a temperature of 37° C. to coagulate the blood; remove the coagulum and place in the cold for 3 or 4 hours, then centrifugalise to remove all the erythrocytes and render serum inactive by putting it into a water-bath at 50° C. for half an hour. For the reaction use 0.2 ccm. It is not necessary to inactivate spinal fluid, since under any circumstances it contains very little complement and proteid material.

(3) *Complement*.—For this one uses the serum of a guinea-pig, which is best obtained as follows:—Anæsthetise the animal, lay it on its back on a board with four limbs drawn out, make incision in the middle line of the neck, dissect with forceps in the loose cellular tissue till trachea is found, then go to one side and discover the carotid artery and vein, separate artery out, clip upper end, hold lower end with forceps, cut between and allow lower end to bleed into a test tube; when no more blood comes, do same with carotid on other side. When no more flows from either artery, squeeze abdomen several times, then puncture heart, quickly open chest and collect what blood there is in the heart. Extract serum and dilute 1:10 with NaCl. Use 1 ccm. for reaction.



(4) *Erythrocytes*.—Sheep's blood is used and can either be obtained from a slaughter-house or from a live sheep kept on the premises, from a vein in the neck. Remove fibrin by glass beads, then centrifugalise to remove serum, add NaCl and again centrifugalise, and this should be repeated for three or four times till pure washed blood corpuscles are obtained and these should be diluted with NaCl 1 : 19. Take 1 ccm. for reaction.

(5) *Hæmolytic Serum*.—A rabbit is injected intravenously at intervals of five days for 3 or 4 times with 0·5—1 ccm. of the washed sheep's erythrocytes. We have found it a distinct advantage to inject 1 ccm. into a vein in the pinna, and after five days 10 ccm. into the peritoneal cavity, repeating the latter injection 4 or 5 times, since it often happened that the animal died when injected twice intravenously. To get blood from the rabbit, obtain a pipette with an ampulla, rub xylol on the spot where the pipette is to be inserted (border of ear), to prevent coagulation, puncture a vein, and draw blood out. Put pipette for  $\frac{1}{2}$  hour in incubator at 37° C. to cause coagulation, remove serum. Should any blood corpuscles be present in the serum, centrifugalise, make inactive for  $\frac{1}{2}$  hour at 56° C. Keep in the cold. It keeps its action a long time.

Immunising rabbits is difficult, very often it is impossible to immunise them to a high degree, not infrequently a rabbit will begin to give good immunised serum, later losing this capacity, and in this state further immunising has no effect.

A fresh rabbit should be immunised every two months. Owing to these difficulties Maslakowetz and Liebermann, when they have obtained a highly immunised rabbit, take as much blood from it as possible, inactivate the serum, dry it in an exsiccator over  $\text{H}_2\text{SO}_4$ , collect it in a test tube and solder the same. Such dried serum does not lose its power. Since by drying it loses  $\frac{9}{10}$ ths of its original weight, this should be made up with distilled water. Since every immunised serum is of different strength, when new it should be tested as follows :—

First make solution of 1 : 10 (NaCl), then dilute from 1 : 100, 1 : 200, etc. up to 1 : 1,000. In every test tube put 1 ccm. of the series of diluted serum, add 1 ccm. of a 5 per cent. emulsion of erythrocytes, 1 ccm. complement in dilution of 1 : 10 and 2 ccm. NaCl. Put all in incubator at 37° C. for

$\frac{1}{2}$  to one hour. The last tube in which a complete hæmolysis occurs is the dilution required for the reaction.

The quantity should be doubled for use. For instance, say, dilution 1 : 200 is last tube of complete hæmolysis, the dilution of serum for use will be 1 : 100, and of this use 1 ccm. for reaction.

Reaction is now as follows :—(a) Antigen 0.2 ccm. fill tube to 1 ccm. with NaCl. (b) 0.2 ccm. patient's serum in 1 ccm. NaCl. (c) Complement 1 in 10.1 ccm.

Heat at 37° C. for one hour, then add :—(d) 1 ccm. hæmolytic serum (double dose). (e) 1 ccm. 5 per cent. emulsion sheep's red blood corpuscles. Leave 2 hours in incubator and about 6 to 8 in the cold.

Controls are in all cases necessary, and these must prove that neither the antigen nor the antiserum alone, nor the combination of antigen with normal serum, nor the combination of antiserum with a heterologous antigen, should fix the complement. While the tubes are in the incubator they should often be shaken, since should the hæmolytic serum be weak, the red corpuscles will fall to the bottom before they have given up their hæmoglobin. Again, should the blood have not been fully washed, in the reaction the fibrin of the plasma separates out, and, being heavy, falls to the bottom, either taking the red cells with it or covering them over and so preventing hæmolysis as above.

Wassermann and Plaut lay great stress on the fact that only luetic material (antigen) reacts with the serum of infected apes, and that serum from luetic apes only gives a reaction with syphilitic material from men and apes, never with non-syphilitic material of men or apes. Neisser, Bruch, and Schucht laid stress on the fact that luetic serum should react only with luetic antigen and not with normal material.

Examinations showed that tissue extracts from normal apes reacted every time negatively ; therefore normal tissue contains no syphilitic antigen.

Not long after Wassermann's communication, various authors, independent of one another, found that syphilitic antigen could be replaced by using extracts of normal organs. Watery extracts of normal organs were first used, then alcoholic, with decidedly better results ; so the conclusion drawn was

that the reaction was a chemical one, depending on a substance which was more soluble in alcohol than in water. This substance was looked upon as being of a lipoidal nature. This being the case, pure lecithin was used as the antigen with positive results.

Levaditi then drew attention to the fact that this substance was not soluble in æther, and he thought it belonged to the group of the salts of the bile acids, since by using *natrium taurocholicum* and *glycocholicum* a more constant reaction was obtained than by using lecithin.

Without going any further into this question any observer can verify for himself how untrustworthy the results are when these chemical substances are used as the antigen. We found that when we used normal extracts an alcoholic gave better results than an aqueous; while Wassermann, using syphilitic extracts, advocates an aqueous in preference to an alcoholic solution. Why this should be, no satisfactory explanation is as yet forthcoming; but as normal extracts are trustworthy this is a considerable advance in the field, owing to the difficulty of obtaining syphilitic material.

We have had this difficulty and been compelled to use normal extracts; using an alcoholic extract of guinea-pig's heart, which is prepared as follows:—1 gram. of the heart muscle is cut up as small as possible and pounded in a mortar with sand, this is then put into a flask containing glass beads and 50 ccm. of 95 per cent. alcohol and well shaken, then it is digested for two hours at 60° C., during which time it should be several times stirred. Filter and keep at room temperature.

Even after filtering a deposit often occurs and one should be careful not to get any of this in the test, as it is capable occasionally of producing a positive reaction; so either re-filter before use, or only use top portion of fluid.

Lately we have found ox's heart to be more satisfactory.

We are sure that an aqueous solution of syphilitic material is the most advisable, but since the same material as antigen should be invariably employed, and since our results with ox's heart extracts are so uniformly good, we have no hesitation in advocating their use.

Our method of carrying out the test also differs and is as



follows :—

Say we have six sera to test, then we use 13 test tubes and number them 1, 1a to 6, 6a and the 13th tube *a*. 1a is the control for the corresponding serum and "*a*" alone is the control for the whole and in it hæmolysis should always occur, and the test is not ready till this has taken place. Every tube first contains the same quantity of physiological saline solution, about 20 drops. In 1, 1a to 6, 6a we put a drop of the respective patients' inactivated serum, then in every tube one drop of the complement and in "*a*" tubes two drops of the extract (two drops because alcoholic drops are smaller than watery). Place in incubator for an hour, then put in every tube one drop of red blood corpuscles and one drop of tested hæmolytic serum and again place in incubator for about an hour or until "*a*" is completely hæmolyzed, then test is ready.

Testing the hæmolytic serum is carried out as follows :—

Get some tubes, each holding 20 drops NaCl. Make a solution of 1 : 10 of the hæmolytic serum ; that is, put one drop of hæmolytic serum in a tube with 9 drops NaCl. Now we have a solution of  $\frac{1}{10}$ th hæmolytic serum ; from this make  $\frac{1}{10}$ th,  $\frac{1}{100}$ th,  $\frac{1}{1000}$ th,  $\frac{1}{2000}$ th. To make a  $\frac{1}{10}$ th put in a tube two drops of NaCl and one drop of the  $\frac{1}{10}$ th solution, and so on. Put in incubator for about half an hour and then look out for the tubes in which complete hæmolysis has occurred. Say it has occurred in the  $\frac{1}{10}$ th,  $\frac{1}{100}$ th,  $\frac{1}{1000}$ th, but not in the  $\frac{1}{2000}$ th, then the dilution lies somewhere between the last two, and to find this out we make another test, using every 10th number between 100 and 200. Again put in incubator for an hour and take the last tube in which complete hæmolysis has occurred. Say this is  $\frac{1}{160}$ th. This shows that the hæmolytic serum in the dilution of  $\frac{1}{160}$ th has complete power of causing an hæmolysis. For the test this is doubled, which equals  $\frac{1}{80}$ th. The hæmolytic serum is consequently diluted to  $\frac{1}{80}$ th, and one drop from this is put into every tube in the test. Another modification we have lately made is using active immune serum, and have examined 1,500 cases. In each case the serum was tested both as active and inactive, with the result that we found that patients with a latent and patent lues which gave no reaction or a weak one with inactivated serum, gave a complete positive reaction with the active.

Further, and this is most important, active sera never gave a positive result in a non-luetic case. As far as we can tell, this alteration will yield better results ; but before coming to a definite conclusion, many sera from all kinds of diseases must be examined, since our cases have been almost exclusively syphilitic or questionably so.

We have examined nearly 5,000 sera and find in lues in taking all stages of the disease together 80-85 per cent. positive. A positive result where syphilis was to be undoubtedly excluded has not occurred.

In the primary stage 30-40 per cent., depending upon the age of the sclerosis. In quite young scleroses we have never obtained a positive result.

In secondary syphilis, about 85 per cent., but here again the result depends on the stage of the disease.

In the tertiary stage about 70 per cent. worked out as positive.

These results cannot fail to impress the utility of the reaction.

We cannot agree with those authors who lay stress on the influence of treatment on the result. Our investigations allow us to come to no definite conclusion. With positive reacting rabbits' serum we were not able by mercurial injections to change it into a negative reaction. Therefore one must consider that those cases which are negative in spite of numerous cures, and always at the end of the last become again affected with a recidive, depend not on the influence of the mercury, but on an earlier failure of the anti-substance. In those cases where the reaction was too weak to give a diagnosis, we were guided by the clinical symptoms and anamnesis. Our latest work with active sera brings such cases down to a minimum. One cannot help noticing that the published records of positive results in non-luetic cases are gradually diminishing.

When examining sera from different diseases as control, it is very hard to exclude syphilis in some of them. We had a case of carcinoma which gave a positive result, no history or sign of syphilis could we at the time obtain. Not long afterwards the patient returned to hospital with the pupil changes of commencing tabes.

Unless this case had been the second time examined it

would have been put in the category of positive results by malignant disease. Again, a case of periosteal sarcoma gave a positive reaction, the patient was operated on and the swelling was found to be not a new growth, but a chronic inflammation, probably syphilitic. Earlier it was thought that cases of tuberculosis, diabetes, and septic fever gave positive results here and there, but each month such results are on the decrease.

One must also remember that many who work in serum-therapy have not had the opportunity of studying the clinical side of syphilis, and all syphilologists know well that a man may have tertiary symptoms as his first, the primary chancre can be extragenital and overlooked, and secondary symptoms are by no means invariably the rule.

A positive result in the primary stage is of enormous value since one can start treatment at once, and the abortive treatment of syphilis undoubtedly has a good influence on the course of the disease.

Supposing a patient has a chancre diagnosed clinically and spirochaeta positive, but gives a negative reaction, the course is to excise the chancre, and test the blood from time to time, since it is possible the patient may have no further sign. Unfortunately at the present state of our knowledge we cannot lay down laws with regard to marriage. Supposing the individual concerned gives a positive result he or she should be strongly warned against marrying.

On the other hand that it is negative, it may be negative because patient is cured, gone through a cure, *i.e.*, cured for the time being, or the serum fails to react, cause unknown. The best plan to adopt in such cases is to go carefully into the history, especially with reference to last cure, and advise patient to wait two or three months and test serum again. If positive, course open is obvious; if negative, tell patient that it would be better not to marry, relating consequences that may occur, but that, as far as one can tell, at the present he or she is cured, but a possibility of a recurrence is always open, and finally advise a strict cure just before marriage.

By the help of the reaction we have now a means of being able to tell if a process is the result of syphilis or not: such as the positive results by tabes and paralysis absolutely confirming the clinical observation concerning the syphilitic



relationship; also the positive results one so commonly gets in aneurism, aortitis, and general arterio-sclerosis.

As a help in diagnosis one has only to mention the ulcerated legs by women. A syphilitic anamnesis is often difficult and untrustworthy by women, and a diagnosis between a syphilitic and varicose ulcer is by no means easy. Then there are the differential diagnoses between new growths of bone and chronic syphilitic inflammation, and the difficult differential diagnosis between tuberculous and syphilitic epididymitis and orchitis and new growths of the testis.

In the diagnosis of eye-diseases:—Leber, in cases of undoubted syphilitic disease, obtained 92·2 per cent. positive results; 83·9 per cent. in parenchymatous keratitis; 33·3 per cent. in iritis; 28·0 per cent. in choroiditis and retinitis.

Leber, before the German Ophthalmological Society, Heidelberg, 1907, tested the aqueous humour as to its antibody contents and obtained the same results as by using blood serum. This reaction has not only proved of great benefit in the diagnosis of the disease, but also in clearing up many difficult questions in the syphilitic teaching.

Knöpfelmacher and Lehdorff have proved the right of Colle's and Profeta's laws by the serum diagnosis, and found that 78 per cent. of all healthy looking mothers who have born syphilitic children have given a positive reaction in their serum years after the birth, and that most probably they are not immune, but latently ill.

There is a class of case where this test is of great service, that is by the syphilidophobe, because up to the present we have had no means of diagnosing syphilis in its latent stage.

The value of the test as regards life in insurance is at the present minimal, owing to the limited knowledge of the effect of the syphilitic poison and its relation to disease.

The test can also be useful where wet nurses come under consideration.

Besides being used for testing the blood serum, Levaditi and Marie investigated the spinal fluid, and obtained positive results in cases of tabes and general paralysis; thereby strengthening the view of the syphilitic origin of these diseases. General paralysis gives a positive reaction in 100 per cent. of

cases, and tabes in 87 per cent.

Another interesting field which this reaction opened up was the discovery by Landsteiner, Müller, and Pötzl that the serum of Dourine infected animals gives positive results. This brought one to the conclusion that the reaction was common to protozoic diseases. The protozoon under question in Landsteiner's cases was the *trypanosoma Gambiense*. Further experiments with trypanosomic diseases were carried out by Hartoch and Jakimoff. They worked with seven rabbits, two of which had been infected a year before, and one two months with the Dourine trypanosome. These rabbits were treated with atoxyl. The other four were freshly injected. The serum of the four gave before the infection a negative reaction, as also two other rabbits which were used as control. But 11-13 days after the infection, and also the serum of those treated with Atoxyl gave a positive result.

These experiments were carried out, using heart extract of a normal guinea-pig as antigen. Next antigen was used from the liver of guinea-pigs which had been infected with various kinds of trypanosomes (Dourine, Nagana, Mal de Caderas, Surra), in order to see whether a certain dependent condition was present between the so-called specific receptor and the various specific antigens; but the result was in all cases the same.

These results are interesting, and they show that a specific antigen is not necessary for the reaction, also that the reaction is not a simple combination of an antigen with its specific antibody (after Ehrlich), and further that syphilis must be a protozoic disease, confirming Schaudinn's discovery of the *spirochæta pallida*; and that protozoic diseases have something in common, in that they react positively years after the infection, or after treatment or even when the disease is immune. The same authors found complete disappearance of hæmolytic complement in guinea-pigs, infected with various trypanosomes, just before death.

Eichelberg got positive results in frambœsia, sleeping sickness, dogs infected with *piroplasma* and hens infected with the hen *spirochæta*. Other diseases were tried against this reaction and Much and Eichelberg stated that cases of scarlet fever almost invariably gave positive results.

We cannot agree that scarlet fever reacts positively and Much's and Eichelberg's results are probably due to the fact

that they used 0·3 ccm. of antigen, when 0·2 ccm. is the maximum dose. Eitner from the clinic of Riehl ascertained that the serum of a case of leprosy with a watery extract of a leprous nodule gave a complete reaction, also a second case with alcoholic extract of guinea-pig's heart.

Meier, in the Virchow hospital in Berlin, who had the opportunity of testing the serum of a case of leprosy where syphilis was to be excluded, obtained a positive reaction with a watery extract of syphilitic liver and an alcoholic extract of a guinea-pig's heart, and likewise a precipitation with lecithin and natrium glycocholicum.

Later, Meier went to Bergen in Norway, and examined with Dr. Lie, the director of the leprosy hospital, twenty-eight cases of the disease. Results :—

(1) The complement binding reaction with watery as well as alcoholic antigens gave in the majority of cases a strong positive reaction.<sup>1</sup>

(2) The precipitation with lecithin and sodium glycocholicum was identical with that given by lues.

(3) The positive cases concerned exclusively the tuberous florid cases and not one case of the maculo-anæsthetic leprosy gave a positive reaction.

(4) A series of cases were tested against tuberculin, and only those cases which had given a positive reaction with organic extracts gave a positive result.

The positive reaction with tuberculin was a complete one, not as one usually finds in sera from cases of tuberculosis.

A similar strong reaction with tuberculin was also obtained by Meier in a case of Raynaud's disease. The conclusion is that leprosy reacts as syphilis, but differs in the fact that the former reacts with tuberculin, while the latter does not. This points all the more to the reaction being a chemical one, and to syphilis containing a substance similar to leprosy. Some modifications of the reaction should be mentioned here :—

(1) Sodium glycocholicum. Method :—(a) Dissolve 1 gram. of sodium glycocholicum (Merck) in 100 c.c. of distilled water, *i.e.*, a 1 per cent. solution. This should be freshly prepared before each test. (b) Inactivate the serum. (c) Obtain very

<sup>1</sup> Slatincano and Denielopel, as well as Gaucher and Abrami, later confirmed these results.



small test tubes and add equal quantities of serum and solution. Allow both fluids to mix, but be extremely careful not to overshake. Let test remain 16-20 hours at room temperature.

The following controls are necessary :—For every serum under examination make a control using sodium chloride, instead of sodium glycocholate; needless to say, the control should always be clear. This control is especially necessary if the serum to start with is a little cloudy, due generally to chyle. (Blood should always be taken in the morning.) Have one tube containing sodium glycocholate alone, because it is possible for this to form a precipitate or become cloudy. If many sera are being tested this is unnecessary, because every tube will give a positive result, showing that something is wrong. After this time a sort of skin forms at the top of the fluid and on very gently shaking flakes fall or a precipitate falls to bottom of tube. Such is a positive reaction. Cloudiness of the fluid or only a trace of precipitate must be regarded as negative.

We tried quickening the reaction by using the incubator, but a positive result is obtained in almost every case, and it must be remembered that natrium glycocholicum is an excellent media for micro-organisms; this latter is also the reason why the solution should invariably be employed fresh.

The addition of carbolic acid, contrary to statements by Fritz and Krein, causes, as any acid will, the precipitation of anodic colloids and with them also natrium glycocholicum. The sera should be as like one another as possible, since presence of hæmoglobin may lead to untrustworthy representation of the result.

The test should be examined by side light and it is a help to have a moveable black background. The test is not so simple in that it is extremely difficult to discriminate between a complete positive and a nearly complete positive reaction.

We have tested several sera with the same results, arriving at the same conclusion that, owing to the positive reaction by other diseases where syphilis was quite to be excluded, the test could not be held as diagnostic, and was not as to its worth to be compared with Wassermann's. Our positive results by lues worked out at 80 per cent., but we obtained 13 per cent. positive by other diseases where syphilis was undoubtedly to be excluded, and further the amount of precipitate showed

no relation to the acuteness of the disease, since an untreated syphilitic case gave what one might call a weak reaction, and vice versâ.

(ii) Klausner found that with the serum from syphilitic papules and scleroses from blood serum fromluetics, a precipitate occurred on the addition of distilled water, a precipitate which did not occur in non-syphilitic serum until very much later. Klausner added to 0.2 ccm. serum, 0.7 ccm. distilled water, and obtained a precipitate in a few hours. This test has no diagnostic value.

(iii) By the close relationship which exists between the complement binding and Kraus' precipitin the idea occurred to Fornet and Schereschewsky as to whether it was not possible to prove syphilitic antigen and anti-substance through precipitation, as had been observed in typhoid and tuberculosis where bacterial præcipitinogens were proved in the serum of patients the subjects of these diseases.

The reaction is the precipitate which occurs when two bodies meet, which Kraus calls præcipitinogen and præcipitin. For instance, take the serum of a horse and add to it the serum of a rabbit which has been previously injected with horse's serum, a thickness of the fluid or precipitate occurs. The rabbit's serum added to the serum of a sheep produces no reaction. The horse's serum contains the præcipitinogen, the rabbit's serum the præcipitin.

In the same way by the meeting of various antigens with their corresponding antibodies a similar reaction can be obtained. A typhoid bouillon culture, after filtration to free it from its bacteria, will give a reaction on the addition of the serum from a rabbit previously inoculated with typhoid bacilli, or the serum of a typhoid convalescent patient.

Fornet and Schereschewsky then showed that a similar result took place when an extract of a syphilitic liver was added to the serum of a rabbit previously injected with syphilitic material, and such did not occur when a normal extract was used or a rabbit which had not been previously injected. The syphilitic liver holds the luetic præcipitinogen and the serum the luetic præcipitin.

Fornet and Schereschewsky with Rosenfeld and Eisen-Zimmer proved the reaction in serum from syphilitic patients and paralytics. As a rule the luetic serum contained the syphi-

litic præcipitinogen, and the paralytic serum the præcipitin. The test is carried out and interpreted as follows :—

(1) Bringing the serum of a syphilitic patient and that of a paralytic together, as in the Heller test for albumin in urine, on contact a ring occurs.

(2) This "ring" is a precipitation and no optical defect.

(3) The occurrence of a "ring" with two patients' sera is to be regarded as specific, when neither gives a ring with normal serum.

(4) Such a reaction is not influenced by the fact stated by Ascoli and Centanin that sometimes a precipitation occurs on the meeting of an undiluted with a diluted serum.

(5) Physically pure, clear sera from healthy individuals gives no precipitate when brought together undiluted.

The positive results described by the authors were in the majority of cases obtained with undiluted sera.

Later the sera were diluted and the test carried out in the following manner :—

(a) Quite clear serum of a tabetic or paralytic (blood is best taken early in the morning). The serum should be filtered.

(b) Clear serum from patient under examination.

(c) Serum from a positive luetic case and a positive non-luetic case to serve as controls.

(d) Tubes from 8 cm. high and 0·5 cm. wide. These stand in a test tube stand, at the back of which is a black piece of cloth or paper, which is capable of being moved.

(e) Pipette to hold 1·0 ccm. and must be divided into a hundred parts.

From (a) and (b) one prepares dilutions of 1 : 5 and 1 : 10 respectively, also from (c). Then 0·15–3·0 ccm. from the diluted serum (a) is added to same quantity diluted serum (b) (contact method). One puts the serum (a) first in the test tube, since it is the heavier, not being so diluted. Serum (c) is treated in the same way.

The combinations will now be as follows :—

- |  |  |
|--|--|
| (1) a + b  | (2) a ( $\frac{1}{5}$ th) + b                  |
| a + b ( $\frac{1}{5}$ th)                        | a ( $\frac{1}{5}$ th) + b ( $\frac{1}{5}$ th)  |
| a + b ( $\frac{1}{10}$ th)                       | a ( $\frac{1}{5}$ th) + b ( $\frac{1}{10}$ th) |
| (3) a ( $\frac{1}{10}$ th) + b                   |  |
| a ( $\frac{1}{10}$ th) + b ( $\frac{1}{5}$ th)   |  |
| a ( $\frac{1}{10}$ th) + b ( $\frac{1}{10}$ th). |  |



The controls (c) with dilutions will be used in the same way. Leave for two hours at room temperature, and then in positive cases a ring occurs at junction of the two fluids. The controls with non-luetic sera must be invariably negative and the others positive.

When the reaction is positive one gets a ring when the serum of a luetic and the serum of a general paralytic are joined, and this occurs both in the diluted and undiluted sera.

It was also found that the same ring appeared on joining luetic serum with normal serum, normal serum with paralytic, and normal with normal.

Fornet mentions that all kinds of opacities, cloudiness, etc., can occur in bringing together two kinds of sera, and then mentions certain facts in which one can recognise a specific opacity. Although these signs may be sufficient for him, other observers do not find them so, and generally come to the conclusion that the test as a diagnostic one of syphilis is useless.

Grüber showed that in many cases this *præcipitin* picture was an optical phenomenon, or that in some cases it referred to a separation of salts or a falling out of the albumin.

(iv) Maslakowetz and Liebermann, who, finding that they could not get enough blood from a guinea-pig, being a small animal, used blood from placenta and from a pig, after the following method:—(1) Antigen 0.2 ccm. of an extract from guinea-pig's heart. (2) 2.0 ccm. patient's serum. (3) Serum from placenta or pig which had been previously tested as regards strength of the complement and hæmolytic power. They multiple the result obtained by four, and use 1 cc. for the reaction. (4) Make up to 4.0 ccm. with physiological NaCl and put in incubator at 37° C. for 1 hour. (5) Then add 1.0 ccm. 5 per cent. emulsion sheep's red corpuscles and place for 2 hours at 37° C. After which 6–8 hours in cold.

Notice avoidance of use of prepared rabbit's hæmolytic serum, avoided since authors noticed that placental and pig's blood possessed hæmolytic properties.

If a specific amboceptor is present in serum under examination, the complement binds with the antigen, and for the solution of the hæmoglobin no free complement is at hand, so the result is a prevention of the hæmolysis, a positive result.

The authors controlled their work with the Wassermann

reaction, and found, not only that both tallied, but that they never got a positive reaction in a non-luetic serum.

After further experiments the authors came to the conclusion that pig's blood was much better than placental blood, its hæmolytic power being greater; consequently they now work exclusively with the former.

(v) Tschernogubow's Method.—The fresh blood of a luetic contains complement and a specific antibody in its serum, so when an extract of a syphilitic organ or a specific antigen is added to it (after dilution with saline solution) and the mixture is heated for 1 hour at  $37^{\circ}$  C., then by the further addition of a hæmolyte serum which has been rendered inactive, and the whole placed anew in an incubator, a hæmolysis does not result. Supposing a specific antibody to be present in the examined serum, this will form a chain with the specific antigen and the complement which is in this case at hand, since the serum was not inactivated, so that by a further addition of hæmolytic inactivated serum for the human red blood corpuscles, no free complement for the fulfilment of a complete hæmolytic system remains over, so no hæmolysis occurs.

Should no antibody be present, then the antigen, not meeting with its antibody, results in the complement remaining free, so a hæmolysis:—

Technique:—(1) Take 0·1 ccm. blood and dilute it with 10 ccm. sodium chloride (0·9 per cent.), that is a solution of 1 : 10. (2) Prepare extract from syphilitic liver and dilute it, using 1 part extract to 100 parts sodium chloride. (3) Prepare hæmolytic serum by injecting rabbit with well-washed human red blood corpuscles, the hæmolytic power being tested as before described. Use 0·25 ccm.

Get 4 tubes and proceed as follows:—

| Tube 1.                           | Tube 2.  | Tube 3.   | Tube 4.  |
|-----------------------------------|--|---|--|
| 0·1 ccm. blood.<br>1·0 ccm. NaCl. | 0·1 ccm. blood.<br>1·0 ccm. NaCl.                | 0·1 ccm. blood.<br>1·0 ccm. NaCl.<br>1·0 ccm. extr. | 0·1 ccm. blood.<br>1·0 ccm. blood.<br>1·0 ccm. extr. |
|                                   | Put in incubator at $37^{\circ}$ C. for an hour. |   |  |
| 0·25 ccm. hæmo-<br>lytic serum.   | 0·25 ccm. NaCl.                                  | 0·25 ccm. hæmo-<br>lytic serum.                     | 0·25 ccm. NaCl.                                      |

Put in incubator at  $37^{\circ}$  C. for two hours, afterwards in ice and examine following morning.

In tube (1) hæmolysis must always occur (if blood under examination contains free complement).

In tube (2) hæmolysis should not occur, should an isotonic solution of sodium chloride be used.

Tube (3) depends on presence of specific antibody, if present no hæmolysis, otherwise a hæmolysis.

Tube (4) serves to prove the hæmolytic properties of the liver extract, therefore hæmolysis.

According to the author the results are excellent, and it has a great advantage in that very little of the patient's blood is required, since it can be taken and diluted in a Zeiss' hæmocyto-meter.

(vi) Owing to the difficulty of getting enough blood from a patient or in some cases of getting any at all, Hoehne tried the effect of urine, after that Bab had proved that the substances which are necessary in the serum for the Wassermann's reaction also occur in the milk. Use 1.0 ccm. urine, 0.75 ccm. from a four times diluted alcoholic syphilitic liver extract, with sodium chloride. Add 0.1 ccm. guinea-pig's serum and put at 37° C. for 1½ hours. Then add 1 ccm. 7 per cent. sheep's blood corpuscles in NaCl, and 0.5 ccm. of a hæmolytic serum, using three times the dose. From 43 syphilitic cases, 25 were positive.

Hoehne does not hold the result as positive in the sense of the Wassermann's reaction, and he noticed that the quantity of urine used exerted a decided influence. He considers that the positive reaction does not depend on the anti-complementary working of the urine, but rather upon a hæmolytic working of the extract.

Rondoni showed the hæmolytic working of organic extracts through the addition of acid. Therefore the reaction probably depends on the activating power of the acid urine upon the antigen, which certainly seems to be the case, since neutral urine gives no reaction.

(vii) Ballner and Decastello use for the reaction ox's blood instead of sheep's blood, believing that by this modification an easier distinction between luetic and non-luetic sera can be arrived at, as by the Wassermann's reaction, since they found that with non-luetic sera (positive reacting sera with sheep's blood), by the employment of ox's blood alone, without addition



of extract, no hæmolysis resulted. They call such sera autotropic sera.

Without going further into this it can be mentioned that Marschall and Morgenroth several years ago proved the anti-complementary working of serum against ox's blood, and that this property of human serum against ox's blood makes it without consideration useless, even excepting the fact that guinea-pig's serum on its own account can produce a solution of ox's blood.

(viii) Bauer showed that most luetic sera are in possession of amboceptors to sheep's blood. By the mixture of luetic serum and guinea-pig serum, and the after-addition of sheep's blood, solution of this blood follows, usually slower than when normal serum is used. Add now liver extract, no solution of sheep's blood occurs, a solution always occurring in non-syphilitic sera.

Bauer tested this reaction in 30 cases, controlling with Wassermann's reaction, and both agreed.

For the reaction the following extract is used, after Michaelis and Lesser:—The liver of a syphilitic fetus is cut up as small as possible and shaken over night with 10 times the quantity of absolute alcohol. Filter. The clear filtration is the stock solution and lasts for ever. For use, dilute this solution 1 in 4 with physiological sodium chloride.

One proves then whether 1.0 ccm. hinders the hæmolysis of 1.0 ccm. sheep's blood with 0.2 ccm. normal serum and 0.1 ccm. guinea-pig's serum, or not; should it hinder it, use further dilutions until a dose producing a hæmolysis is reached.

Method of procedure is as follows:—Have 4 tubes. In No. 1 place 0.2 ccm. patient's serum (inactive), 1.0 ccm. extract, and 1.0 ccm. of a  $\frac{1}{10}$ th dilution of guinea-pig's serum. No. 2. The same, except that extract is replaced by saline solution. No. 3. Same as No. 1, only normal serum is used. No. 4. Same as No. 3, except that extract is replaced by saline as in No. 2.

Put test for  $\frac{1}{2}$  hour in incubator at 37° C. Then add 1.0 ccm. of a 5 per cent. suspension of sheep's red blood corpuscles in saline. In 15 to 45 minutes Tubes 3 and 4 begin to clear, earlier or later No. 2 behaves in the same

way, while No. 1, if luetic, remains cloudy (*hemmung*). Reaction should be complete in 1 to 1½ hours.

The reaction is only positive when a complete hæmolysis occurs in the last three tubes.

Lipæmic serum, on account of its complement binding properties, is useless for the reaction. To prevent this, take blood from patients who have had no food for some time, best is early in morning. The reaction does not succeed in sucklings, since they do not possess the amboceptors against sheep's blood; therefore add proved normal serum of a grown-up.

This method has two advantages: firstly, it does away with the use of an artificial hæmolytic serum, and, secondly, less patient's serum is necessary. The latter is a great advantage, since obtaining blood from a vein in the arm, besides being extremely objectionable for the patient, a subcutaneous hæmorrhage, or hæmatoma, not infrequently results, being both painful and liable to septic troubles.

The primary syphilitic stage did not yield many positive results, but one must remember that it is quite likely that the specific substance was not present in the blood at this time.

From 113 cases of secondary lues only two were negative.

(ix) Another method towards simplification of the reaction is from Hecht, which rests on the same principle as the preceding.

Human serum is taken which contains complement and the amboceptor for sheep's blood; for antigen use extract of guinea-pig's heart.

A 2 per cent. solution of washed sheep's blood corpuscles are used, diluted with 0.95 per cent. sodium chloride.

Obtain three test tubes. In No. 1 comes 1.0 c.c. sod. chlor. and 0.1 c.c. serum. No. 2, 1.0 c.c. diluted antigen and 0.1 c.c. serum. No. 3, 1.0 c.c. diluted antigen and 0.2 c.c. serum.

For the control, have one containing 1 c.c. antigen, and one 0.1 c.c. a positive reacting syphilitic serum, and one 0.1 c.c. a non-reacting normal serum. Place test in incubator at 37° C. for one hour, then in every test tube place 1 c.c. of the diluted sheep's blood corpuscles and replace in incubator. After one or two hours test should be ready.

No. 1 tube, containing natural complement and amboceptor

with blood, gives an hæmolysis, being a proof that the serum possesses enough complement and amboceptor. Should the hæmolysis be incomplete or nil, then two factors come into consideration: either want of complement, or want of amboceptor. In healthy, fresh serum enough complement and amboceptor are always present, but luetic serum contains less amboceptor. Should a serum not contain sufficient quantity of the requisite substances, either tested adequate serum can be added, or artificially produced sheep's blood amboceptor.

In No. 2 there can be either a hæmolysis or not according as the serum under question contains antibody or not. A positive reaction is of no diagnostic worth unless a complete hæmolysis has been given by No. 1.

In No. 3. Supposing a hæmolysis is not present and in No. 1 there is a hæmolysis, then it shows that the double quantity of complement has become bound and that a great deal of antibody must be present. When a hæmolysis occurs, no hæmolysis in No. 2 and complete hæmolysis in No. 1, then one is dealing with a serum which contains little antibody. The controls serve to prove the utility of the antigen, since it may possess hæmolytic properties.

A non-hæmolysis in No. 2 with a complete hæmolysis in No. 1 is a positive reaction. Supposing no sign of hæmolysis occurs after test has been two hours in the incubator, then a failure must have occurred somewhere, try to correct it by the addition of certain amboceptor containing serum and allow test to remain an hour. If then not completely hæmolysed, from No. 2 one can tell presence or not of antibody. This reaction has been tested against the original Wassermann and agrees with it.

Much can be said for and against these modifications, but no hard-and-fast lines can be drawn since the original Wassermann's reaction is purely empirical. Our own observations lead us only to the conclusion that these modifications are of little diagnostic worth, since positive results do occur in non-syphilitic sera, which is not the case with Wassermann's reaction.

We wish here to express our gratitude to Professor Finger, who was good enough to allow us to make use of his enormous material.





## VACCINE THERAPY IN GENERAL PRACTICE.

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IN the application of opsono-therapeutic measures to general practice, a fair knowledge of bacteriology is, of course, necessary. Of the many excellent handbooks on laboratory work, I have found D'Este Emery's *Clinical Bacteriology and Hæmatology* most helpful. It will well repay reading, even if the reader does not intend to do the practical work himself.

A great advancement in the treatment of infective diseases was made, when Sir Almroth Wright announced his discovery in the blood of protective substances, which he showed "prepared food for"\* the white blood corpuscles, or phagocytes, in order to enable them to perform their function of engulfing and destroying invading bacteria. These substances he, therefore, called "opsonins,"<sup>1</sup> and devised a method by means of which it is possible to estimate, in figures, the content of these protective substances in any given sample of blood, and consequently any deficiency or increase in their amount during the course of an invasion by infective organisms.

Although the technique requires but simple laboratory instruments, it necessitates great patience and conscientious work; but it can be carried out by most men, who will devote sufficient time to thoroughly master its details.

The fundamental principles, on which vaccine therapy is based, depend on the observations made by Sir A. E. Wright and his co-workers.

The introduction, subcutaneously, of a certain number of dead bacteria into the human organism is followed by a definite succession of changes in the opsonic content of the blood, provided that the dose is sufficiently large. There is an immediate fall in the quantity of opsonins, followed by a rise above that prior to the inoculation, then a gradual return is made to or below normal. These are known as the Negative

\* "Οψωνω: I cook for table, I prepare food for.

phase, Positive phase, and the phase of Increased Resistance respectively. It is scarcely necessary to add that during the first there is a diminution in the resisting power of the patient to that organism, whereas the resisting power is greatly increased during the second and third phases.

As a rule, unless the dose has been excessive, this Negative phase lasts but a few hours, being followed immediately by a prolonged well-marked rise of the index, higher than the point at which it stood when the inoculation was administered. These phases are shown clinically by changes both in the focus of infection and in the general condition of the patient. For example, in a case of *B. coli* infection of the bladder, with vesical pain, irritability, and frequent micturition, a marked Negative phase, following a large dose of *B. coli* vaccine, is associated with aggravation of the symptoms and malaise, which quickly pass off leaving the patient in a much better condition than before the treatment. After a time, dependent on the size of the dose and the idiosyncrasy of the patient, this improvement wanes, and he tends to return to his original condition.

The aim of vaccine therapy is to so arrange the sequence of doses that the patient receives another dose before his phase of increased resistance has terminated, thus obviating a Negative phase low enough to cause distress. It necessarily follows that, when a patient's index before treatment is low (say .6), it is imperative to begin with a dose sufficiently small to produce an almost negligible Negative phase, which is followed by a reaction, bringing his index up to normal or near it, so that a subsequent dose, given before the ensuing fall, will then raise his resistance still higher, when a larger dose can be given with marked benefit as the Negative phase will now be easily borne. Very useful information on this subject was afforded in the special number of THE PRACTITIONER for May, 1908.

Cases of acne frequently do well with weekly doses of 100 to 200 million staphylococcic vaccine of the aureus, citreus, and albus mixed; yet others will fail to yield, even with the most praiseworthy perseverance of doctor and patient, simply because the trouble is kept up by the action of the acne bacillus, which is present in most cases of acne, especially in those, in which the pustules come up in little white heads

without obvious pus. Staphylococcic vaccine may cure the added infection of pyogenic organisms, but may hopelessly fail to cure the patient of his acne. These cases will usually be found to have a low opsonic index to the acne bacillus, and will rapidly improve when treated with 5 to 10 million doses of a vaccine prepared from this organism, not necessarily obtained from the patient himself.

This bacillus is of very slow growth, hence it is frequently invisible when a culture is made from one of the patient's "spots." It only grows on an acid medium (it has been reported to grow on glycerin agar), and often takes 10 to 20 days to appear, at times showing up after the pyogenic organisms have died out.

The treatment of boils and carbuncles only occasionally proves disappointing, and the failure is then frequently due to insufficient dosage. In these cases, I give 250 millions of mixed staphylococcic stock vaccine, which I prepare with three volumes of aureus and two of citreus, and repeat, in most cases, in three days with a dose of 500 millions. Smaller doses do not cause incipient boils to abort in the theatrical manner in which the larger ones do, and, as a rule, no malaise or other discomfort, indicative of Negative phase, is produced by such a dose. Should a case of boils, carbuncle, or staphylococcal abscess fail to improve, an opsonic count will, as a rule, solve the difficulty if taken three or more days after the last inoculation, the index will probably be found to be moderately low, 0.8 or 0.9, calling for smaller but often repeated doses, thus avoiding undue excess in the Negative phase. As soon as the index is above normal, a dose of 500 to even 1,000 millions may be given, after which marked improvement will almost certainly result.

Mention must here be made of those staphylococcal infections in anæmic, unhealthy patients, who, at times, are inclined to do badly, if their opsonic content is not watched. They often have a very low index, and large doses of vaccine are not admissible till this reaches normal. In these cases, doses of 50 to 100 millions, repeated every 24 to 48 hours at the commencement, will be followed by the best results.

Where, in a case of furunculosis, there has been a fresh crop of boils or increased pustulation, or where, in connection



with a staphylococcal abscess, there has been an increase in pain and in the amount of discharge, we may take it that there has been a Negative phase. Where a Negative phase has been severe or prolonged, it is probable that the dose has been excessive, and, should a large dose be administered during this stage, the added Negative phase, produced by this inoculation, will of course aggravate the disease, and it will be long before pendulum of reaction will swing into the Positive stage.

Conversely, if, after an inoculation, a patient improves for a day or so, and then relapses into the condition before treatment, it is probable that the dose given was too small.<sup>2</sup>

It is not always easy to correctly interpret the clinical symptoms, but failure is almost impossible if dosage is controlled by the opsonic method.

Those cases of suppurating small wounds, with lymphangitis and acute infection of the corresponding lymphatic glands, respond in a remarkable degree with doses of 200 to 300 million staphylococcic vaccine.

Styes are rapidly aborted, and do not recur, when suitable doses of staphylococcic vaccine are given. Usually 100 millions, followed three days later by a dose of 250 millions, will be sufficient.

Impetigo is usually one of two varieties: one in which scab formation is present from the first, usually due to staphylococci; the other a bullous or vesicular form, in which scabs appear later; this is nearly always due to streptococci, and usually clears up in three days with stock vaccines made from streptococci from similar cases. As a rule, 5 million streptococci, 50 million staphylococcic vaccine, will suffice to cure such cases.

Bullous onychia, usually a troublesome and recurrent condition, is invariably primarily due to streptococcic infection, and will yield to one or two doses of a streptococcic vaccine prepared from a similar case, or from the case itself. The pus from these bullous abscesses gives a pure culture of streptococci. When this condition has persisted for some time there is frequently an added infection of *B. coli*, which may prevent a cure from being effected till a vaccine prepared from this organism has been administered in doses of 5 to 10 millions.

Chronic ulcer of the leg of the indolent type is frequently associated with added infection of *B. coli*. I have obtained

remarkable results, following the isolation of, and administration of a vaccine, prepared from this bacillus, with complete cure in 10 days, in a case that had resisted all ordinary surgical treatment for two years.

Tuberculous glands invariably respond to tuberculin, if given correctly, *i.e.*, in correct doses at correct intervals, as judged by opsonic estimate in conjunction with clinical symptoms. Usually doses of  $\frac{1}{8000}$ th to  $\frac{1}{10000}$ th of a milligram T.R., at intervals of 8 to 10 days, is sufficient. Treatment must extend over a period of 3 to 6 months or more.<sup>3</sup>

The administration of yeast tablets, 5 grs. t.d.s., is a valuable adjunct to treatment, for it raises the phagocyte content of the blood, as much as sixfold.

Local application of dry heat by sand is useful to increase the circulation of the part; sand is mixed with small fragments of white paper, heated in a pan till the paper begins to scorch, then poured into a suitable bag and applied each night. Fomentations are not good as they render the skin sodden, and may be the cause of added infection by penetration of pyogenic organisms.

The breaking down of a tuberculous gland, while under tuberculin treatment, is not of bad omen; on the contrary, after aspirating, it will rapidly heal up. It may be necessary to repeat aspiration. When aspiration is used to evacuate the contents of a breaking-down gland, it should be done early, before the skin has become broken down, thinned out, and of low resistance.

In the treatment of ulceration from breaking down of tuberculous glands, the application of Bier's congestive treatment is of considerable value, as, when combined with vaccine treatment, it results in the outpouring of highly opsonised lymph through the diseased tissues. This flushing of the ulcer with lymph is facilitated by the application of citrate salt solution. This is accomplished by applying a gauze, or lint, dressing, soaked in a solution of citrate of soda and salt, and covered with gutta-percha tissue.<sup>1</sup> It is better to

<sup>1</sup> The solution mentioned above consists of salt 2 to 4 per cent. and Sod. Citrat. 0.5 per cent. The former induces an osmotic flow of lymph from the surrounding healthy tissues through the fibrous walls into the sinus. The latter prevents coagulation of the lymph.

leave the ordinary antiseptics (acid carbolic and hydrarg. perchlor.) alone. In chronic sinuses, it will be sometimes found that the opsonic content of the discharge is far below that of the blood, even though that of the latter may be high, and this state of affairs is due to the thickened tissues round the sinus being almost impenetrable to the lymph. In such a condition, vaccines will obviously do little till a good flow of highly opsonised lymph is provided through the tissue involved. Plugging with gauze, soaked in citrate salt solution, will, however, do much to effect this; scraping away the fibrous barrier may be necessary in order to effect a cure. In such a case, albumin-coagulating antiseptics are obviously harmful. Where there is brawny thickening of surrounding cellular tissue, due to coagulation of surrounding effused lymph, it is beneficial to lower the coagulability by administration of citric acid as such (4 grms. *ter in die*),<sup>3</sup> or in the form of lemon juice, 4 to 6 lemons being necessary daily for a couple of days.

I would like to draw attention to those pale, fretful, easily tired children from five years of age upwards, with no appetite, with possibly a few glands in their neck or groin, children that are never well, and are "bad doers." These cases often do remarkably well, gaining in colour, appetite, weight, and vigour after a few doses of tuberculin.

In view of the recent experiments by Vansteenberghe and Grysez,<sup>4</sup> which bear out Behring's<sup>5</sup> views that the child's bowel is the chief portal of tubercular infection, the remark of Butler Harris<sup>3</sup> is well worth remembering, "I am firmly of opinion that a delicate child, with a few shotty glands in the neck and a few in the groin, has many more shots in the locker of the mediastinum and mesentery."

In all chronic cases of suppuration, it may be necessary to find what added infection is keeping up the condition. At times most unsuspected organisms are found in the discharges; *B. coli* and Friedlander's bacillus frequently, streptococci quite often; I have seen *Proteus vulgaris* helping to keep up such irritation.

Cases of pulmonary phthisis occasionally do well under tuberculin in conjunction with "open-air treatment," but, as in such cases auto-inoculation constantly occurs, it is very difficult



to control their indices, and it is impossible to obtain satisfactory results without constant opsonic estimates, and absolute control of the patient's exertions.

The ambulatory phthisic, whose index is usually 1·4 to 1·6, will often, if kept recumbent, show a subnormal index, and inoculations can then be given in doses carefully regulated by opsonic estimates. In these circumstances, a weekly dose of  $\frac{1}{100000}$  m. grm. T.R. is, as a rule, sufficient, but here one of the chief difficulties is the apportioning a suitable initial dose, and the only safe method is to commence with a minimal dose, and observe the effect on the patient's opsonic index.

The question of dosage in vaccine therapy is one of the most difficult, as patients vary exceedingly in the way in which they respond to one and the same dose. Speaking broadly, I have found that thin, anæmic, "run-down"-looking patients only stand small doses as compared with their robust-looking brethren; and, in all cases, when in doubt, one should begin with minimal doses, observing the effect produced on the opsonic index.

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THE ETIOLOGY OF HERNIA.<sup>1</sup>

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I PURPOSE to limit my remarks to injury as a factor in the causation of hernia, to speak only of oblique inguinal hernia and to consider the question mainly from the medico-legal standpoint, "Hernia an accident?" as it is sometimes briefly termed.

"Excessive strain must be regarded as an injury" epitomises a judgment of the House of Lords, the highest legal tribunal in England, and it is to "excessive strain," generally from lifting, that a workman commonly attributes his hernia or "rupture," as it is as a rule wrongly and most unwisely termed. Now no one doubts that a working life which day after day exhibits "excessive strains" is a life which contributes to the production of hernia, but this is not sufficient to constitute hernia an accident within the meaning of a "Compensation Act." I must limit myself to considering when (if ever) the surgeon is justified in supporting the view of the workman that the hernia from which the latter suffers is due to a single "strain."

In the industrial area in which I live divergence of opinion amongst medical witnesses before a lay arbitrator unassisted by medical assessors has commonly resulted in the arbitrator, in the midst of a mass of ill-understood technicalities, following the line of least resistance and giving judgment for the workman in these hernia cases, the *post hoc ergo propter hoc* view being naturally considered the easiest one. So now it seldom happens that the hernia cases are legislated on and the workmen receive the compensation which the law enacts.

As an example of an ordinary case in which the right to compensation is commonly undisputed the following will suffice: A. B., a collier, says: "On such and such a date at such

<sup>1</sup> Delivered before the Congress of the International Society of Surgery, Brussels.

and such a time I was lifting an unusually large lump of coal and I felt a sensation of something giving way in my right groin. My fellow-workman, X. Y., was with me at the time and I mentioned the matter to him. I finished my day's work. That same evening when washing I found a lump in my right groin. Next morning I went to the doctor." Variations of this history occur. Nothing may be felt locally at the time of the supposed causing of strain. It may be days or weeks after the strain before the workman discovers the hernia. The hernia when found may be large or small. The hernia may be attributed not to a strain but to a blow in the groin, abdomen or elsewhere or to some other cause. The presence of a double hernia is sometimes attributed to a single strain.

I believe that such associations as the above of strain and hernia as cause and effect are fallacious. I do not believe that the workman usually intends to deceive (although undoubtedly cases of deception do occur), but he is influenced first by that natural desire common in the lay mind to find a definite cause for his disability; secondly, by his immediate introduction to that most misleading term "rupture," often unfortunately used by the first doctor who sees him; and thirdly by the very practical wish to obtain money for the maintenance of himself and his family during his period of disablement. Our sympathies must be with the workman, but at the same time it is our duty as surgeons and as scientific men to endeavour to determine under what circumstances, if any, his view of the matter is a true one.

I believe that the sudden first appearance of a hernia in the sense that it constitutes an accident arising from excessive strain is a very rare but not an impossible event. I consider that its sudden complete development in a pathological sense is impossible because the peritoneum cannot stretch suddenly to form the sac. The peritoneum is incapable of sudden but is capable of very great gradual extension: it is only the sudden clinical development of a hernia which is possible, and what happens is the sudden projection of a small amount of contents into an unobliterated funicular process, the process being of such size and laxity as to be able at once to constitute a definite sac. The cause of this is most likely to be straining in an unnatural attitude: ordinary straining efforts close the



inguinal rings. Localised blows cannot cause a hernia.

The sudden projection of hernial contents into the pre-formed sac is accompanied by *definite immediate* symptoms. The affected individual suffers acute pain at the site of the hernia, at once undoes his clothes, finds a small lump there, is faint, has nausea or sickness, ceases work at once, and has to be helped or carried home. The hernia is only reducible with difficulty if at all and is often strangulated. A medical man is at once consulted.

Must not the above be so? Parts unaccustomed to it are stretched. Parts, some of which (particularly the subperitoneal connective tissue), are known to be highly sensitive and well supplied with nerves. The highly sensitive mesentery of the bowel is dragged and nipped in a tight fascial embrace. The vascular supply of the bowel and the passage of its contents may be interfered with. Acute pain, tenderness, nausea, sickness, faintness and general distress are natural sequences. Then the true traumatic hernia must be small at first: the sac is almost always small and even imagining a large lax sac, the other parts would only permit of a limited sudden extension, and also the normal mesentery is not long enough to permit descent of contents far below the normal level. I believe the sudden first appearance of a scrotal hernia to be impossible. That the individual ceases work is I believe practically always true. I once knew of a plucky young adult who after the sudden first appearance of a hernia attempted for two or three minutes to go on playing football, but this is quite exceptional and occupation can only be persisted in with pain and difficulty for quite a short time. Strangulation is a very natural result when we consider how closely the elastic sac neck must contract again after its sudden expansion and how apt the contents will be to swell.

I think it highly probable that in all these sudden "first appearances" of hernia the individuals really had herniæ in infancy, the contents of which disappeared during the process of growth (*i.e.*, apparent cure), such condition more readily permitting a second entry which may be sudden. A history of such hernias in infancy can, however, in workmen rarely be obtained. I do not wish it to be understood that I regard the sac of an ordinary slowly developing inguinal hernia as

wholly acquired. I believe that it is in its inception an unobliterated funicular process.

"The supposed sudden development of a true hernia," says Tillman, "is in my opinion always due to a mistake in observation." (Tillman, *Text Book of Surgery*, 1898, Vol. III., p. 180.) Here we have an extreme view if clinical development is meant. That the views which I have above enunciated are neither extreme nor singular is evidenced by a piece of collective investigation which I recently undertook. I circulated a series of questions amongst a number of leading surgeons in my own country bearing on this question of the relation of hernia to injury. About 70 gentlemen kindly replied. Naturally there were some divergencies and differences of opinion, but broadly speaking the collective replies showed a remarkable unanimity and may be summarised as follows:—


Oblique inguinal hernia may develop suddenly. Such an event is uncommon and results from a "strain" of the nature of a lifting effort. The sac of an ordinary oblique inguinal hernia is congenital (opinions by no means unanimous on this point). A scrotal hernia cannot develop suddenly. A sudden hernia is quite small at first. If the hernial sac is "acquired" sac and contents cannot appear suddenly as the result of a "strain." Symptoms would accompany the sudden first appearance of a hernia, viz., pain, tenderness, tumour, inability to continue work and other symptoms. It could not occur unnoticed by the person affected. Similar symptoms would occur if the hernia were present before, and were suddenly increased in size as a result of, the strain.

Here then is a body of opinion which broadly agrees with my own. It must be understood, however, as I have said, that there were many individual differences in the various sets of replies. I hope to publish a paper dealing in detail with these replies at a near date.

Some other points require mention. Where a sudden disabling increase in size in a pre-existing hernia is attributed to injury, similar symptoms to those of a sudden first appearance are to be expected. A double hernia is exceedingly unlikely to appear for the first time suddenly, for the contents would hardly be so arranged over the patient's patent funicular pro-

cesses that they could suddenly enter at the same moment. A hernia may be felt for the first time during a straining effort, and this is very likely to occur in the working classes who are constantly straining. This, however, is, as someone phrases it, the occasion leading to the discovery of the hernia; it is not its cause.

I have been concerned in a number of cases in which claims have been made by workmen for hernia alleged to be due to accident. None of these cases satisfied the definite grounds which I have already given for connecting hernia with accident. In the majority the connection was of the most flimsy and indefinite character, yet the accident claim was admitted in all but one of the cases in which I know the final legal results. I had hoped to give details of these cases, but considerations of time forbid. Further, I am aware that there is a far larger number of cases than those in which litigation actually takes place in which on equally indefinite grounds compensation is paid with little or no dispute. Also I have obtained detailed statements regarding the supposed causation of their herniæ from between one and two hundred workmen upon whom I have operated. In almost all (innocently but quite falsely) the hernia has been attributed to some "strain" or "accident." In private patients similar histories are far less frequent.





## RHEUMATOID ARTHRITIS: ITS CLINICAL ASPECTS, DIAGNOSIS, AND TREATMENT.

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I WAS fortunate enough, several years ago, to hold the post of Resident Medical Officer to the Hospital at Buxton, and there I had ample scope for the special study of a very large number of cases of Rheumatoid Arthritis. I have seen a good many also since coming to Cheltenham.

I propose for consideration the lines of clinical aspects, diagnosis and treatment, as being practical ones to adopt.

Among the different names which have been given to the disease are Rheumatoid Arthritis, Arthritis deformans, Osteoarthritis, Polyarthritis chronica, Mechanical or Traumatic Arthritis, Arthritis Chronica Villosa, and Rheumatic Gout. Under the circumstances, it is not quite easy, perhaps, to choose the best. Arthritis deformans is descriptive of the condition in its commonest and most easily recognisable form, and therefore probably the most suitable.

Rheumatoid arthritis seems, however, the one most popularly adopted by the profession, and for that reason it appears to be the right name to use.

To this disease the following definition has been given :— a progressive degeneration of joints of a special kind, accompanied by atrophy of some structures and hypertrophy of others.

Rheumatoid arthritis is really merely a name given to a number of conditions the cause of which is unknown. It is probable, I think, that there is more than one disease to account for the different types of so-called rheumatoid arthritis.

The course of the disease is variable, but is usually towards irrevocable damage to structures involved. It is a disease of great antiquity : there are in the Museum of the Royal College of Surgeons bones showing characteristic changes which date back to 1300 B.C., and, although it has had so much attention

for so long a time, there is perhaps no other disease in which such confusion exists as to its pathology and place in medicine.

Various theories have been put forward with regard to the causes and pathology, but owing, no doubt, to the want of post-mortem investigation (the disease not being in itself a fatal one) there has been a great diversity of opinion about them.

During the last few years researches in the direction of bacteriology have, to a great extent, modified former ideas and thrown light in a new direction. Joints have been aspirated and the fluids so obtained examined microscopically and by cultivation, and it is stated by some observers that a specific organism has been isolated.

The general idea seems to be that several micro-organisms have the power of producing the characteristics of the disease, and it is extremely probable that in many cases rheumatoid arthritis is an infective disease, and that it is due to micro-organisms settling in the joints or dwelling elsewhere, and elaborating toxins, which cause a progressive inflammatory condition. It was at one time believed to be of nervous origin because of the symmetrical nature of its affection, and it is likely that some cases are of such origin.

I have now under my care a lady, aged between 40 and 50, who is suffering from neurasthenia, and who has for several years had symptoms attributable to derangement of the nervous system, in whom, during the last two years, pain and thickenings characteristic of the slow chronic form of rheumatoid arthritis have developed in the fingers.

*Classification.*—The disease may be best classified into, firstly : Polyarticular Rheumatoid Arthritis; and this may be

- (a) Acute,
- (b) Subacute, or
- (c) Chronic ;

and secondly : Localised, Monarticular, or Senile Rheumatoid Arthritis.

#### I.—POLYARTICULAR.

(a) *Acute.*—The acute type usually occurs in children or young adults, and in it the change is seen chiefly in the synovial membrane of the joints. The attack usually com-

mences with pain and swelling of the joints, with probably elevation of temperature, both general and at the sites of inflammation. The joints usually affected are the smaller ones: those of the fingers, or fingers and toes, may be the first; often a slow, progressive swelling commences in the metacarpo-phalangeal joints of the index and middle fingers, and it may spread from these to others until most or all joints are involved. If the larger ones are affected, excess of fluid may be evident, giving a tense, elastic feeling; this can be specially elicited in the knees. In other cases no fluid can be made out, but the joint has a characteristic doughy feel. The pain is often persistent and tends to be increased at night; there is some redness of the skin, although discolouration is not as a rule marked. The swelling, frequently fusiform, is either tense and resistent, or soft and pulpy. Contraction of wasted muscles and of surrounding fibrous tissue leads to deformities. The constitutional disturbance is similar to that in other acute febrile diseases. The attack may follow on one of acute rheumatism. The acute symptoms after a time subside, and with suitable treatment the disease may be arrested; or the condition becomes chronic.

(b) *Subacute*.—It is hardly possible to say definitely where the acute form ends and the subacute begins; or where the subacute ends and the chronic begins. The symptoms are similar to those of the preceding variety. Symmetrical enlargement of, and pain in, the joints, which may be confined to a few; or one joint after another becomes involved and, unless the disease is arrested, crippling, perhaps in a few months, occurs; and the subacute form is followed by the chronic, and in this there is often a subacute attack from time to time. Sometimes dense fibrous adhesions follow cases of acute or subacute rheumatoid arthritis in which there has not been much exudation into the joints, and this formation of fibrous adhesions is a manifestation of the development of a chronic trouble.

(c) *Chronic*.—As has been already stated, this form may follow either an acute or subacute attack; more usually, however, and especially when commencing in adult life, it begins slowly, attacking first one joint and then another. Perhaps the first indications to the patient are numbness and



tingling in the limbs ; some complain of stiff neck, pain across the back, and neuralgic pain in the forearms or down the back of the thigh. A feeling of weakness in the muscles and fatigue after slight exertion may be indications of the commencement. *Often* the onset is first noticed by either pain or swelling, or both, in the joints of the fingers, sometimes also in those of the toes. It may then pass to the other and larger joints until all are affected. Sometimes it commences in one of the larger joints and may be confined to that one ; this is much more likely in males than in females (I have noticed that in females it seldom commences in a large joint). An injury is occasionally the exciting cause in these cases. The enlargement of the joint is often irregular and nodular, with definite osseous outgrowths. In some late cases the joint shows a combination of bony enlargement, with increased thickening of soft parts and fluid effusion.

A very chronic form is one where the disease remains localised in the terminal phalangeal joints, and there gives rise to hard nodular outgrowths known as Heberden's nodes. I have seen these nodes also in subjects in whom the disease is more general.

The chronic variety is the most common form, and it is generally the easiest to recognise, usually seen between the ages of 20 and 50, and much more frequently in females than in males. It has been said that 80 per cent. of the female cases begin at the climacteric. This greater tendency to the disease in females is supposed to be due to uterine disturbances. Pelvic diseases and the menopause as predisposing causes are certainly important conditions.

The general health of women is lowered at the change of life, and they are then liable to suffer from diseases of the reproductive system ; probably the most likely to influence the production of rheumatoid arthritis are those associated with hæmorrhages from the uterus, and also to a less degree with copious purulent or muco-purulent discharges.

Uterine displacements and ovarian neuralgia have also been thought to bear some causative relation to the disease. It has been suggested that a failure on the part of the ovary at the climacteric to exercise its normal influence on general nutrition may be a cause rendering women liable to rheumatoid

arthritis at that time, and that the use of ovarian extract may be of service in the treatment. The disease occurs early and in severe forms in association with rapid child-bearing and overlactation. I have often known patients trace the commencement of the attack to a confinement.

Influenza is, no doubt, a predisposing cause of the disease ; so are depressing influences acting directly upon the digestive system, or indirectly through the nervous system, such as hard manual labour with imperfect diet. Prolonged mental anxiety and worry may be included as being very frequently present in the history of these cases.

HISTORY.—The onset is insidious and often difficult to fix upon from accounts given by patients. Premonitory symptoms are observed sometimes, such as abnormal sensations in the extremities, tingling, pins and needles, and numbness, especially on waking from sleep. These sensations are complained of early ; often there is with them an affection of the joints to be made out on careful examination, and some enlargement may be present. Stiffness of joints may be an early sign, and frequently appears before pain is complained of ; it should always suggest the possibility of rheumatoid arthritis.

As a rule the patient complains of pain in various parts, usually worse at night after getting warm in bed, and often described as of a dull aching character and frequently referred to the bones or joints (sharp pains and burning are also complained of) ; stiffness in the joints ; weakness of the limbs and inability to move them freely ; loss of appetite ; dampness and coldness of the extremities ; general weakness and gradual wasting. On inquiring into the family history, there is often found to be a tendency to *phthisis*, rheumatism, or gout ; sometimes several members of a family suffer more or less from rheumatoid arthritis. I have been impressed with the frequency of *phthisis*, and I believe this to be a definite predisposing constitutional cause.

In advanced cases the general aspect of the patient is distinctive : the face almost characteristic, pale and wasted, with a somewhat sunken appearance around the eyes, where there is often a dark circle ; the body and limbs emaciated, and the joints twisted and otherwise distorted, so much so

sometimes that the patient is a helpless cripple.

LOCOMOTORY SYSTEM.—This is the one chiefly affected and occasionally is apparently the only one. The joints most frequently attacked are those on which the maximum amount of strain is put, namely, those of the fingers. The form and direction of the joints are altered by disorganisation; those in which changes are particularly obvious are the hands, wrists, elbows and knees. There is a tendency for the disease to start in the peripheral joints and to spread to those nearer the trunk, first invading the upper, then the lower limbs, the lesions ultimately becoming symmetrical; occasionally identical joints in the two limbs are attacked simultaneously. The interphalangeal joints (especially the proximal ones) are thickened and more or less fusiform in shape, the knuckles enlarged, and the fingers, which are frequently dislocated, are in most instances turned towards the ulnar side (ulnar deviation). The thenar and hypothenar eminences do not escape and the general wasting of muscles of the limb may be so decided as to simulate the changes in progressive muscular atrophy.

There is wasting particularly noticeable of the interossei, tendons near joints become thin and stretched, and very pronounced deformities of the hands and other joints occur in many cases. The wrists are similarly enlarged, and there are sometimes soft swellings around; so the elbows, which are often altered in shape and affected as regards movement.

The knees are frequently very much increased in size, both by bone enlargement and by fluid; usually there is flexion. In cases where there is apparently no excess of fluid the joints appear doughy from thickening of the capsules and matting of the surrounding tissues, and movement is limited by periartritic adhesions which may be so dense as to lead to an erroneous diagnosis of bony ankylosis. In some cases there is abnormal mobility of these and other joints and crepitation or grating may be felt in them, due probably to creaking of thickened periarticular tissues; in others, very limited movement caused by the presence of osteophytic outgrowths which may lock the joint and give rise to partial or even complete ankylosis. I think the joints in which ankylosis (usually fibrous) occurs most frequently are the wrists and shoulders; next, perhaps,



the knees and hips (it also occurs in the fingers and other joints). There is often *apparent* movement at the shoulder-joint when the arm is raised, but on closer examination it is found that the movement is rotation of the scapula.

The temporo-maxillary joint is one commonly affected, and the resulting ankylosis may be so firm as to lead to considerable difficulty in feeding. The sterno-clavicular and joints of the spine, especially in the cervical region, are often involved. Spinal arthritis is progressive, and leads to atrophy of the ligaments, cartilages, and intervertebral discs, with ultimate ankylosis and permanent spinal rigidity and deformity. There is, I think, no joint which the disease never attacks. There is often a condition of talipes valgus.

Atrophy of muscles is very evident in many cases. The extensors of the joints suffer usually more than the flexors. The hands are generally clammy, and frequently there is a local or general perspiration. Freckle-like or other pigmentation of the skin is sometimes to be noticed, also enlarged bursæ, in which loose bodies are to be found; the latter occur also in joints.

CIRCULATORY SYSTEM.—In several cases there is accelerated action of the heart, and murmurs are to be heard in many. There is great diversity of opinion as to the exact condition of the heart; it is thought by some that there is a tendency to inflammation of the pericardium and endocardium, and in one at least of the diseases called rheumatoid arthritis in children there seems to be post-mortem evidence of adherent pericardium in a number of cases.

Valvular diseases, no doubt, are not uncommon, but in these cases a history of attacks of acute rheumatism is often to be got. I feel sure that endocarditis and pericarditis are not nearly such frequent complications in rheumatoid arthritis as they are in rheumatism. Degenerative changes may occur in the heart and vessels.

NERVOUS SYSTEM.—Sensations of tingling, pins and needles, numbness, and burning have already been referred to; there are also neuralgia, neuritis, and vasomotor disturbance. These all show that the toxin acts very perceptibly on the nervous system; it is doubtful, however, whether it acts on the cord as a whole or upon certain segments, or whether the result

be a disturbance of function or some gross pathological lesion. A very constant pain in rheumatoid arthritis is that in the back of the neck, radiating upwards over the head. Possibly this and the pain in the lumbar region may be caused by inflammatory lesions in the spinal column pressing on the nerve-trunks. The knee jerks and deep reflexes generally are exaggerated, especially in the acute stages of the disease, and sometimes ankle clonus is found. Raynaud's disease and exophthalmic goitre are sometimes associated with the disease.

INTEGUMENTARY SYSTEM.—A common occurrence is the presence of pigmentation of the skin, and although I think that the diagnostic value of this has been somewhat overstated (inasmuch as it occurs in connection with so many chronic diseases) in all cases of arthritis of doubtful type it should be looked for, and, if present, it favours the assumption that the case is one of rheumatoid arthritis. It exists as brownish streaks over the temporal regions, under the eyes, and around the neck; also mole-like discolourations and freckles occur in the face and other parts, especially the forearms. I have seen them also on the knees. The nails are often dull and brittle and show longitudinal striation. Eczema and psoriasis are occasional accompaniments. The hands and feet are usually cold and clammy, often covered in the palms and soles with a profuse sweat. Fibrous nodes occur, chiefly in the forearms and thighs, and occasionally there is ganglion-like distension of the sheaths of the tendons of the muscles of the hands.

THE DIGESTIVE SYSTEM is very often affected, and dyspepsia may be an exciting cause of the disease. The teeth should always be examined; they are frequently carious and in such a condition as to favour absorption of toxins and to prevent complete mastication, and thus give rise to fermentation and impaired nutrition generally.

As regards the other systems, anæmia is a marked feature; it is persistent and not very amenable to treatment. The hæmoglobin value of the individual red corpuscle is reduced, and there may be some increase of white cells. The lymphatic glands are sometimes enlarged in the axilla and groin, there is as a rule no enlargement of the spleen.

There is nothing particular about the urine; excess of urea, and uric acid and occasionally glycosuria have been noted;

also a diminution of phosphates and calcium salts.

The association of this disease with abnormalities of the reproductive system is an important one and has already been alluded to.

## II.—MONARTICULAR OR SENILE RHEUMATOID ARTHRITIS.

This occurs in late middle life or old age, is much more frequently met with in men than in women, and differs markedly from the other varieties; it is essentially local and has little tendency to symmetrical arrangement, and none to become general.

There is often a history of an injury. There is neither pyrexia nor evidence of constitutional disturbance. The larger joints near the trunk are the ones most apt to suffer, and in this respect it greatly contrasts with the localisation of the polyarticular form in which the small peripheral joints, especially those of the hands, are so frequently attacked as almost to constitute a diagnostic feature. As a rule, pain is the first symptom complained of, and it is generally looked upon as due to rheumatism or neuralgia. It is intermittent, gnawing, often worse at night, and increased by movement. When the hip is affected, pain is sometimes referred to the knee, but as a rule it is felt over the trochanter or in the groin. Gradually (perhaps after some years) stiffness, limitation of movement, and grating come on, power of rotation is impaired, and standing or walking causes pain. There is probably, later on, considerable shortening of the limb, owing to absorption of the head of the bone and wasting of gluteal and thigh muscles.

The leg is generally everted and adducted. The pelvis is tilted, and raised on the unaffected side, and this increases the apparent shortening of the limb. Afterwards there is difficulty in flexing the body and the patient avoids stooping.

When the shoulder joint is affected there is much impairment of movement of the arm, which cannot be raised without pain, and it and the scapula move together. If a joint is examined, considerable thickening may be found, due to bony outgrowths. Any attempt at passive movement is painful, and grating and cracking can be felt and heard. The hip joint is the one most frequently attacked, those next in frequency being the shoulder and knee. Tendon reflexes are increased. The disease appears to be a pure degeneration, due to some



trophic or vascular malnutrition.

*Diagnosis.*—The affections for which this disease is most liable to be mistaken are rheumatism, gout, and sciatica. It is in the early and slowly progressive cases of a chronic nature, in which there is not any very marked enlargement of bone apparent, and in subacute attacks, that the chief difficulty arises in differentiating rheumatoid arthritis from rheumatism. The points which may serve as a guide to diagnosis are :—

(1) From Rheumatism.—(a) In the chronic form : invasion of the small joints first (notably the proximal phalangeal joints of the first and second fingers and the metacarpophalangeal joint of the first finger and thumb), fusiform swelling, symmetry of the affection, prevalence in women, affections of temporo-maxillary articulation and those of the cervical spine, pain along the clavicle, crepitation or grating felt in the joints on movement, muscular atrophy especially interossei, clamminess of extremities, tendency to spread from small to large joints, anæmia always present, family history of phthisis. (b) In subacute attacks : it may be for the first few days impossible to decide. The small joints are attacked first, without any tendency to rapid migration ; the swelling is circumscribed ; symptoms persist, although under treatment ; there is little tendency to high temperature curve ; there is very little (if any) tendency to endocarditis and pericarditis. Garrod went so far as to consider the absence of cardiac inflammation as one of the most important diagnostic features of rheumatoid arthritis, and said he had never traced either endocarditis or pericarditis in this disease.

(2) From Acute Gout.—In the latter there is a tendency to commence by sudden pain and swelling, especially of the great toes, with œdema and redness. It is rare in women. From chronic gout it may be more difficult, but enquiry into the history will throw light. The deformities of chronic gout may resemble to some extent those of advanced rheumatoid arthritis, but in gout there are definite attacks occurring from time to time, and usually deposits of urate of soda will be found near the articulation or in other parts, such as the ears or hands. It occurs more frequently in men, and there is little or no tendency to emaciation. It is of

great importance that the two conditions should be differentiated, because the treatment of them is so essentially different. A case of rheumatoid arthritis must not be subjected to a regime so necessary in certain conditions of gout. There are some cases in which, I believe, both diseases are present.

(3) From Sciatica.—Where the hip joint alone is affected there is often a resemblance in the symptoms to those of sciatica. A diagnosis can usually be made by careful examination of the part. In rheumatoid arthritis the affected leg cannot be crossed over the other without causing great pain. If the foot is jarred pain is felt in the joint. There may be considerable thickening, due to bony outgrowths. There may be grating felt on rotation. The general pain is referred more to the joint than to the region of the sciatic nerve and down the limb.

Charcot's joint disease is thought by some to have the same pathology as rheumatoid arthritis, the suggestion being that the affection is rheumatoid arthritis occurring in a patient debilitated by the cord disease. There is in Charcot's disease no pain in the joint, although there is so much degenerative change that the functions are in abeyance. Monarticular rheumatoid arthritis, usually in one of the larger joints, may simulate a tubercular affection, and the differentiation is at times extremely difficult. The vertebral column is sometimes involved to such a degree that the pain and rigidity may lead to the belief that spinal caries is present, and great care is needed in distinguishing these affections.

Still's disease in children closely resembles rheumatoid arthritis, and is, possibly, a modified form of the disease; its nature is uncertain; it occurs mostly in young girls. It differs from rheumatoid arthritis, however, in that the spleen is enlarged and also the liver. The lymphatic glands are increased in size at first, near the joints, and later throughout the body. There is defective development, the eyes may be prominent. It is usually a fatal disease, although it may last for years.

*Treatment.*—Although this is a progressive and by some considered an incurable disease, much can be done in the way of treatment, in the early stages to arrest, and in the more advanced cases to relieve, the condition. It is a disease

which seems to attack a constitution which has been debilitated from some cause, and it is of great importance therefore to refrain from any kind of lowering treatment, either in acute or chronic forms. In acute and subacute cases the patient should be in bed ; an endeavour to relieve pain should be made by putting on soothing applications : lint wrung out of lead and opium lotion, or a liniment composed of the liniments of belladonna, chloroform, and aconite, covered by mackintosh and wool, usually gives great relief. The joints should be kept at rest while acute symptoms last, and as soon as they subside gentle movement should be begun as there is great tendency in this affection for the joints to become stiff. Splints, if used, should not be kept on continuously. The pain may sometimes be lessened by painting the joints with guaiacol and tincture of iodine, in the proportion of 1 of guaiacol to 6 of iodine. Carbolic compresses (1 to 30 of water) are also beneficial.<sup>1</sup> I have known the application of an ice-bag give relief when other methods had failed ; it should be used with caution. In chronic cases, perhaps there is no more generally useful application to affected joints than blisters ; these seldom fail to relieve pain and stiffness so often complained of and in no joint more successfully than the temporo-maxillary ; they should be small and may be repeated. Mustard leaves are also very useful and are readily applied to any part in which pain is felt, sometimes bathing with hot water does good, rubbing with liniments occasionally is good for joints and muscles. When joints are more stiff than painful olive oil may be used instead of liniment, especially in children. Where weakness of joints is a symptom, or if there are soft swellings around, adhesive strapping is an excellent application ; it gives great support and comfort and tends to reduce the swelling. Scott's dressing may be applied on lint under the strapping when counter-irritation as well as pressure is thought advisable ; sometimes extension with weights is soothing, and helps to counteract the tendency to flexion so often seen. It is specially useful when the pain is severe, as is the case so often in the knees, apparently from rubbing

<sup>1</sup> Mesotan with olive oil or a 25 to 50 per cent. ointment with lanoline may be used. Also methyl salicylate with three parts of olive oil or with six parts of tincture of iodine may be thickly painted over the painful articulation, which should then be covered with lint and oil silk and lightly bandaged.



of the ulcerated cartilages one upon another. Where there is fluid we seldom come across this difficulty, but, when we do, this method is one of the best to subdue it. The weights should not be heavy and should be applied continuously. Fingers which are becoming flexed can be rendered considerably straighter by a suitable splint on the palmar aspect; this should be applied at night and taken off in the morning, so that the fingers may be moved during the day. Patients should be told to use their joints as much as they can, short of giving rise to pain afterwards, also to take exercise in the open air. If the affection is in the joints of the lower limbs, walking is rendered less painful and difficult by the use of an apparatus so constructed with adjustable crutches on wheels that part of the weight of the patient can be transferred from the lower limbs to the axillæ and arms. Adhesions are occasionally broken down under an anæsthetic; the results I have seen do not give encouragement to this treatment, as most of the joints again became stiff (possibly in some cases owing to neglect by the patients themselves in after-treatment).

In some carefully selected cases in which the knee is flexed the advisability of straightening under an anæsthetic with a view to obtaining a stiff joint as a result may be considered. When there is much fluid and tension is great the joint may be tapped.<sup>1</sup>

A question of excision may arise for the relief of ankylosis. Bony ankylosis is rare, and although fibrous adhesions are common, they usually yield to milder forms of treatment. If ankylosis has occurred it is only in a few joints that such an operation would be thought of and only if it caused such crippling as to affect the general health or wage-earning capacity of the patient. It can occur in only the very chronic forms.

Excision, scraping of joint tissues, or merely washing out the joint, in the acute stages has been carried out with a view to arrest the spread of the disease; it is stated that by the removal of the diseased cartilage and synovial membrane of

<sup>1</sup> Cases are recorded in which intramuscular injections of Fibrolysin have reduced swelling, promoted absorption of exudation, lessened pain, and rendered mobile joints which were previously fixed in a position of flexion. The general health also is said to improve considerably under this treatment.

one joint, not only is that joint improved (if not cured), but the other affected joints are also improved.

*Diet.*—This in acute cases should be light, easily assimilated and nourishing: milk, raw meat juice, broth, eggs, sanotogen, etc., and increased to more solid food as the febrile symptoms subside; stimulants may be required. In chronic cases patients should never be on "low diet"; this, like phthisis, is a disease in which good feeding is essential. Meals should be arranged at regular intervals and should be varied. A good supply of nitrogenous food should be taken daily. A diet consisting exclusively or chiefly of meat (a modified form of Salusbury treatment) has been largely used in this disease, and is highly recommended by some. It is not suitable in all cases.

Another method suggested, on the theory that many cases of rheumatoid arthritis are largely dependent on faulty digestion and imperfect intestinal action, is that of excluding meat and substituting a diet consisting chiefly of fermented milk. Successful results, after persisting with the treatment for a lengthened period, have been reported. No hard-and-fast rule can be laid down, and probably the most generally successful diet is a mixed one. Fats are needed, a very good one, if it can be borne, is cod-liver oil; I think virol is even better, and it is usually well taken by children. Milk and cream are also essentials.

*Clothing.*—It is necessary, from the fact that circumstances which depress the general or local circulation act as predisposing causes of the disease, to guard against any exposure to cold and wet. This may be done to a large extent by encasing the body in light woollen clothes at all seasons of the year. A flannel vest and drawers, with a piece of wash-leather inserted next the skin over the joints, is a very good form of garment. As cold generally increases the pain, warm gloves and socks of extra thickness should be worn.

*Climate.*—The most suitable climate is one which is dry, warm, equable, and sunny. Residence at the sea-side is not generally recommended, and sometimes seems to aggravate the symptoms of the disease.

*Medicines.*—Depressing drugs are to be avoided as far as possible. In febrile cases the administration of antiseptics is indicated, as also in many chronic cases. Guaiacol carbonate,

creosote, quinine, salol or salicylates should be given ; these often relieve pain and act beneficially. Salicylate of soda may be given, and is of most use when there is a history of rheumatism ; it should be combined with twice as much bicarbonate of soda and can be given freely, but should not be continued too long. Guaiacol carbonate is now much used and should be given where active disease exists in doses of 5 to 10 grains repeated 3 or 4 times a day. I believe it to be specially applicable where the patient is suffering from some lung complication, and the dose may be gradually increased.

Aspirin and phenacetin give relief to pain. Iron and arsenic are probably the most useful of all drugs for improving the general health (anæmia is always a symptom of the disease and requires treatment). They are best given in combination ; the syrup of the iodide of iron is one of the most suitable forms, and, where the syrup does not agree, the iodide may be given in pill. Other preparations of iron are sometimes preferable. Potassium iodide is often given for the pain complained of at night ; it should be used in small doses and combined with some tonic. For cramps hyoscyamus or cimicifuga is worth trying. Morphia and opium should be avoided if possible. I have not found it necessary to prescribe either, and their routine use is to be strongly deprecated.

Constipation, which is common, and other digestive troubles must be treated with suitable remedies. Sulphocarbolate of soda and the antiseptics already named are very serviceable, and, if there is dilatation of the stomach, it should be systematically washed out. It is important to remedy any oral sepsis, the teeth must be attended to and antiseptic washes used freely. For sleeplessness paraldehyde, phenacetin and bromide are, I think, the best drugs to use. Where gout is present, colchicum and alkalies should be given (colchicum with caution); an alkaline mixture of quinine is also of service.

*Bier's Method of Passive Congestion.*—The chief points of advantage claimed for this form of treatment appear to be the relief of pain, which is often very marked, and the prevention of stiffness. Pain gives rise to muscular spasm, and this causes stiffness. The relief of the pain by congestion enables the joint to be moved, and this counteracts the tendency to the formation of adhesions. It is also said to



promote the resolution of thickening in joints and tendons. There are various ways for producing congestion. That with the bandage is the only suitable method for rheumatoid arthritis, inasmuch as the remedy is employed for hours at a time. Danger need not be anticipated if a broad soft bandage with plenty of padding be lightly applied ; the skin should have rest as soon as it becomes at all tender. Bier's rule is that a congestion bandage for lengthy application must never cause even discomfort or paræsthesia ; if either result, the bandage is too tight or otherwise improperly applied.

*Massage* is of value for the relief of pain and in keeping up the nutrition of muscles it also relieves or prevents stiffness and fixation of joints.

*Electricity* in the chronic conditions, where there is atrophy and debility, and the disease is not in an active state, in the form of a weak continuous current may be of service. I have used galvanism with some benefit to nutrition and lessening of pain. Electric baths are also useful in certain stages, and are given daily at first, then every second day ; it is thought that they modify the course of the disease.

*Radiant heat* is coming much to the fore in treatment of the disease, and has, I think, a promising future. Heat almost always relieves pain, and the most efficacious form appears to be the dry, radiant heat. Besides relief of pain there are other important changes effected : local arterial pressure is diminished and metabolic processes are increased. One of the great advantages of the method is that it can be administered in bed without moving the patient, and this helps us in the acute cases. It is also used with benefit in some of the chronic forms.

*Serum or Vaccine Treatment* is used and acute infective cases have been treated by hypodermic injections of antistreptococcic serum ; I do not think anything very definite can be said at present as to results. If there were present in any case a local suppurative active centre, such as endometritis, erosion of cervix, or possibly a similar condition in the nose or mouth, a culture might be made and a vaccine given, with, I think, good prospect of favourable effect.

*Baths* have long been held in repute ; they are chiefly indicated when the disease is met with early and the patient is

in fair general health ; they are not advisable in the old or debilitated. The chemical properties of the water used is not of vital importance, the chief point is the mode of application. The objects aimed at are : decrease of pain and stiffness in the joints ; a general improvement in the patient's strength and nutrition ; increased elimination by the skin ; and absorption of the swelling around the joints. I am convinced that bathing, with its accompaniments, is a form of treatment which in suitable cases is of the utmost value, and there is not a doubt that, even in some of the most chronic and advanced cases, great relief or permanent benefit is a frequent result. The advantages of a course at a mineral water spa do not consist so much in the special medicinal virtues of the waters used as in the fact that the treatment is carried out with care and skill. The change of air, the modification of diet, and freedom from home cares and worries are all important adjuncts, and patients should be recommended to visit year after year some health resort where such a regime can be provided.



CHRONIC INDIGESTION CONSIDERED AS A  
SURGICAL DISEASE.

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## DEFINITION.

IN health the processes of digestion take place absolutely without consciousness and without sensation. In the ordinary course of events a man, at a variable interval after the last meal, begins to feel a sensation of want, and, as time goes on, this sensation gradually deepens into one of painful urgency impelling him to take food. The act of filling the stomach is attended with pleasurable sensations, both mental and bodily, and, the meal completed, the individual is suffused with a feeling of mental and physical comfort and satisfaction. From that time until the feeling of hunger returns again the individual is unconscious that the process of digestion is in progress within him. For our present purpose then we may define indigestion as a disorder of digestion in which the ingestion of food is accompanied, or followed, by pain in the region of the stomach, either in front or behind, or both, and followed or not by vomiting, always by flatulent distension, and frequently by eructation.

I would further postulate that indigestion, intractable by medicinal and dietetic measures, has for its cause, in part at least, a physical or mechanical basis.

## ANATOMICAL CONSIDERATIONS.

The abdominal cavity is a great space occupying more than two-thirds of the entire body. It is only with the upper part of this space that we are now concerned, that portion, comprised under the names of hypochondrium and epigastrium, which is bounded below by a horizontal plane, crossing the body at the level of the lower limit of the costal margin. This space occupies the vault of the diaphragm, is closed above by the diaphragm and the thoracic contents, behind by the structures of the back and the lower limits of the thorax, laterally by the ribs, while in front it is bounded by the costal



cartilages which leave a triangular interval—the subcostal angle—closed only by the muscles and aponeurosis of the abdominal wall. Thus it comes about that the upper portion of the abdominal cavity is completely surrounded by bony and cartilaginous structures, except for one half of the anterior wall, that area being a triangle with the base downwards. Below, the space is continuous with the general cavity of the abdomen.

So much for the cavity and its walls. Now let us glance at the contents. Tucked into the diaphragmatic vault we have the liver occupying the whole of the right side and extending over the middle line for a short distance; it completely fills the whole of the right half of the vault from before backwards. In the left side of the vault we have the stomach occupying the whole of the left half from front to back, and extending over the middle line towards the right but below the liver. The liver and stomach are placed in this upper zone of the abdomen like two wedges, their bases being placed laterally against the thoracic wall, and their thin ends overlapping at the middle line, the liver being above and in front of the stomach, and protecting it over the greater part of the subcostal angle.

The position of the stomach in the abdomen is of peculiar interest. It is a pyriform sac flexed upon itself and placed with the large end of the pear upwards. It is placed obliquely in the diaphragmatic vault, and this obliquity is threefold. It is oblique from behind forwards, it is oblique from left to right, and it is oblique from above downwards. The result of these three obliquities of the stomach is of peculiar importance from a practical standpoint. It follows, from this peculiar attitude of the stomach in the abdomen, that the fundus is placed high up against the roof and posterior wall of the diaphragmatic vault, and that the body of the stomach curves forwards, downwards, and towards the middle line under cover of the thoracic wall and the liver, and presents a limited surface only below the liver in the subcostal angle. This surface of the stomach presenting in the subcostal angle is less than one-fourth of the entire area of the stomach, and is the portion of the stomach least frequently affected with disease. In contact with the anterior wall of the stomach is the diaphragm, left lobe of the liver, and the structures comprising the subcostal angle. Behind, the stomach rests on the spleen,

the pancreas, the duodenum, the commencement of the jejunum, and the left kidney.

From these anatomical considerations, it will be apparent to every one that the stomach occupies a position which is at once sheltered and protected, and from the clinical point of view most inaccessible. It is true that in certain conditions, such as dilatation of the stomach and gastroptosis, a large area of the stomach comes in contact with the flaccid portion of the abdominal wall; but these conditions comprise only a small proportion of the cases suffering from chronic indigestion.

#### SYMPTOMS AND SIGNS OF DISEASE.

*Pain.*—Pain is a constant symptom in disease of the stomach. It varies greatly in intensity in different cases; it may be little more than discomfort, or it may be of a severe, gnawing character which gradually wears the patient down. It may come on immediately after taking food, or at varying intervals of from one to three hours. It may be constant, and aggravated by taking food, or in other cases, in which it supervenes at a long interval after taking food, it may be relieved by taking more food or some warm fluid. In not a few cases the pain does not appear till the late forenoon, and often in these cases it continues till the small hours in the morning, not infrequently waking the patient during the night. Although the pain is thus variable in amount, character, and period of occurrence, there is a singular uniformity as to the site of it. It is felt near the middle line about midway between the xyphoid cartilage and the umbilicus, or, to express it more broadly, in the upper half of the subcostal angle. From this point it frequently radiates to the sides, and not a few patients complain of it passing through to the back between the shoulders.

*Nausea.*—Many patients complain of nausea who are never sick, and, conversely, not a few are sick who have little or no nausea. Nausea is of little value as a guide in diagnosis.

*Vomiting.*—Vomiting, though frequent, is by no means a constant symptom in disease of the stomach. Its occurrence depends largely on the site and nature of the lesion, and on the secondary effects produced by it. In not a few cases it does not occur until the disease is far advanced. This is more particularly observed in cases of malignant disease of the

stomach. It usually occurs in relation to the ingestion of food. It may occur immediately after a meal, being caused by the pain induced by eating, or it may be produced by the patient himself as the only means of obtaining relief from the pain. In many cases, patients have learned by bitter experience that the only way to avoid vomiting is to eat sparingly and of the lightest food, mostly slop food. Thus it is that patients sometimes say that they do not vomit, and only on more extended inquiry is it ascertained that they do not vomit because they are so guarded as to the amount and kind of food they take. Vomiting may occur daily after every meal, except the lightest, or it may occur at intervals of several days, and then the vomiting matter may be large in amount. This, of course, occurs in those cases in which the stomach capacity has been greatly increased.

*The Vomit.*—The vomited matter varies greatly in character and amount. It may be anything, from a newly-ingested meal, little altered since taken, to a pailful of frothy, foul-smelling, fermenting, turbid fluid in which the food is more or less completely disintegrated. In all cases there is an excess of mucus.

The vomiting of blood has always been looked upon as a very important sign in the diagnosis of disease of the stomach, and I suppose it is of some value, but I doubt whether, to-day, thoughtful men attach so much importance to its presence, or absence, as they were wont to do. Time was in the memory of most men when the presence of blood in a vomit, or a vomit of blood, was looked upon as a sure sign of ulceration of the stomach, either simple or malignant, and a profuse hæmatemesis was thought to be a sure sign of simple ulcer of the stomach. I venture to think that few at the present day would have the hardihood to hazard such an opinion. That ulceration of the stomach not infrequently gives rise to hæmatemesis is not to be denied, but we cannot logically infer that because there is blood in the vomit there is of necessity ulcer of the stomach. Nor, conversely, can we infer that because there is no blood in the vomit, nor ever has been, there is no ulceration. The only conclusion that can be logically drawn from the presence of blood in the vomit, is that there is a leak from a blood vessel, probably in



the stomach, and, that that blood vessel, or those blood vessels, may be in an ulcer. Numberless instances could be cited in which hæmatemesis has occurred without ulceration, and Dr. Bertrand Dawson, in a recent paper, referred to a class of cases which he calls "hæmorrhagic gastralgia," in which there is no ulceration properly so called, and in which the hæmorrhage takes place from small erosions.

On the other hand, because there is no history of hæmatemesis, and no blood in the vomit of any case we are investigating, we must not be led to conclude that ulceration is to be put out of consideration. I have seen cases of extensive ulceration of the stomach, with widespread destruction of the stomach wall, in which ulcers had eaten into neighbouring organs, viz.: the liver and pancreas, and one instance can be recalled in which the floor of the ulcer was formed by the pancreas and duodenum, into which there were three fistulous openings. In this case the splenic vein could be seen at the upper border of the pancreas in the floor of the ulcer, and doubtless, if the patient had lived a little longer, she might have had hæmatemesis.

The occurrence of hæmorrhage from the stomach in cases of ulcer is entirely dependent on the rapidity with which the ulcer extends. If the structures forming the walls or floor, or both, of an ulcer undergo rapid necrotic change, then hæmorrhage is very likely to occur, because the conservative thrombosis, and plastic phlebitis, and endarteritis have not time to occur, and thus seal up the vessels. In cases of slowly spreading ulceration, hæmorrhage is prevented by the gradual invasion of the tissues giving time for the development of defensive and conservative changes in the vessels. Thus it will be seen that the absence of blood from a vomit not only is no indication that ulceration does not exist, but its absence may be the patient's undoing, by lulling us into a fancied security. The experience of every practitioner that the occurrence of ulcer of the leg is common while the occurrence of hæmorrhage from these ulcers is rare provokes no surprise; yet the causes acting in ulcer of the leg are exactly the same as those acting in ulcer of the stomach.

*Inspection.*—Inspection of the stomach region may, and, in fact, usually does, reveal nothing. In dilatation of the

stomach, and in cases of pyloric obstruction before much dilatation has occurred, waves of peristalsis may be seen if the stomach is actively contracting, and this peristalsis may be induced by friction of the abdominal wall over the region of the stomach. This information is of value when observed, but the proportion of cases in which this occurs is small, because pyloric obstruction, together with dilatation of the stomach, is only one of the many causes of chronic indigestion.

*Palpation.*—By palpation we can obtain important information as to pain and tenderness. In the class of cases now under consideration we find that palpation of the epigastric region will reveal a tender spot, usually in the region in which the patient complains of pain. The patient will at once indicate when the tender area is touched, which is always near the middle line, either to the right or left of it. It is usually well defined and limited in extent, and is most often situated about the middle of the subcostal angle. The tenderness varies in amount, but is always well marked, and is easily elicited without deep pressure. It may be accompanied or not by a feeling of resistance, and in rare cases by tumour. Palpation of the remainder of the subcostal angle may be negative, and, in fact, usually is so. In some cases more extended palpation into the umbilical and left lumbar region may reveal splashing, a sure sign of dilatation, temporary or permanent, as the case may be.

The most careful and skilful palpation of the abdomen may fail to reveal any gross evidence of disease of the stomach. In fact, after the most careful and thorough palpation the result may be negative, and yet the patient may be suffering from extensive, and even fatal, disease of the stomach. The patient may be suffering from a tumour of the stomach of the size of an average fist, and yet it may not be possible to palpate it. The explanation is all too apparent, because the stomach is so inaccessible for examination, the major part of the organ being securely tucked away under cover of the surrounding structures, leaving only a small portion for palpation, which is tolerably immune to disease. Again, in many cases the nature of the lesion is such as to present nothing for palpation. We must remember that, in cases of ulceration, scarring, and adhesions, the alterations in contour of the affected part are so

slight that they must always remain impalpable, seeing that the part, even if accessible, must be felt through the thickness of the abdominal wall, itself uneven and irregular by the presence of the muscular structures comprising it.

It cannot be too strongly emphasised that palpation in this region is, and must always be, from the very nature of the conditions, crude, and that only gross alterations of contour of a very limited area of the stomach can be ascertained by palpation.

Closely associated with palpation is another sign which gives information of value, and that is cutaneous hyperæsthesia. This is easily elicited by stroking the skin with a blunt-pointed instrument, such as a pencil, along the line of the recti muscles above the umbilicus. By this method, it is frequently observed that there is a hyperæsthetic area below the tender spot as ascertained by palpation. This hyperæsthetic area may be to the right or left of the middle line, and is usually immediately above the umbilicus. The patient will indicate the hyperæsthetic area as soon as the pencil comes to it, and frequently there is a rectus reflex as the area is crossed. After stroking the skin in this region the pencil marks become hyperæmic, and over the hyperæsthetic area the blush of the skin is much more marked than over the other parts, so that the blush of adjacent lines tends to coalesce.

Another point in this connection is the occurrence of hyperæsthesia over the costal margin. If the patient is stroked with the pencil, not now along the left rectus, but obliquely crossing the left costal margin parallel to the middle line, it will be found in some cases that the patient winces as the pencil crosses the line of eighth and ninth intercostal nerves. This sign is not one of frequent occurrence, because the condition producing it is not often met with. It has been observed in those cases in which there is adhesion of the stomach to the anterior wall of the abdomen.

Patients suffering from chronic stomach trouble, who complain of pain in the back between the shoulders, frequently present a sign, and one that may be readily overlooked. If the back of such a patient is carefully examined, there will be found a tender spot to the left of the middle line over the tenth intercostal space. It is easily elicited by pres-



sure with the thumb at the outer border of the erector spinæ, and is only observed over a limited area. There is no hyperæsthesia and no hyperæmia on stroking the skin. Although the tender spot is at the level of the tenth intercostal space, it is probable that the pain is felt through the eighth or ninth dorsal nerves, the posterior primary divisions of which are distributed downwards over spaces inferior to their origin.

Some time has been devoted to these apparently small matters, in the physical examination of stomach cases, because it has long seemed to me that, when, in the process of evolution, nature tucked away the stomach out of reach, some at least of the primary nervous connections with the surface of the body must have been left intact. It is inconceivable that an organ like the stomach should groan under the stress of disease and not hold out danger signals to warn us. Take, for example, disease of the hip-joint. Long before any sign of deformity of the joint occurs, there is pain at a distance from the joint, atrophy of muscles acting on the joint, and limitation of movement—all signs at a distance from the joint, and all brought to the surface by nervous agency, by reflex action. I am persuaded that our advance in the diagnosis of lesions of the stomach will not be by the physical examination of the stomach itself, not by the chemical examination of the juices of the stomach, not by the elaborate investigation of the vomited matters, but by an investigation of those parts which are in anatomical nervous relationship with the stomach.

It may not be unprofitable to enquire a little more closely into these phenomena of hyperæsthesia, hyperæmia, and rectus reflex. It will be observed that the hyperæsthesia, and hyperæmia are situated over the area of distribution of the ninth intercostal nerve near the middle line, and on the right or left of the middle line, as the case may be. These nerves are in anatomical continuity with the great splanchnics, and both are connected with the same segment of the spinal cord, the splanchnics being distributed to the stomach through the solar plexus. We have here then a complete reflex loop with a centre in the spinal cord, and possibly in the ganglia. In the case of organic disease of the stomach, such as malignant disease, ulceration, scarring, and adhesions, sensory or afferent impulses are constantly

being sent from the affected region of the stomach to the spinal cord, and possibly to the sensorium, though not always materialised into actual pain. The centres receiving these impulses or stimuli are in a state of hyperactivity, and the incidence of yet other stimuli from different, but associated, regions increases still further this activity, with the result that simple stimuli are interpreted as pain with consequent vaso-motor reaction, and, it may be, muscular contraction; whereas the same stimuli arriving at centres in a normal state would produce effects far short of this.

Reference has been made to hyperæsthesia at the costal margin. It may here be stated that it has been found in cases of adhesion of the anterior wall of the stomach to the parietes of the subcostal angle, most markedly when an ulcer was present. The intercostal nerves are sensory to the whole thickness of the abdominal wall in this region, and in the instance under consideration the connection between the lesion and the surface is more direct than in the preceding. Here the terminations of the intercostal nerve or nerves are irritated within the abdominal wall, and the hyperæsthesia is on the area of distribution of the same nerve, as also the muscular reflex. In this instance the track of stimulation is up and down the same nerve, while in the preceding instance the paths were widely separated.

*Percussion.*—Percussion is of value in determining the limits of the stomach and its dimensions, but its value is not a little marred by the fact that it may be overlapped by bowel. Percussion, whether practised alone or in conjunction with auscultation, does not afford us much real assistance in diagnosis. Mere size, outline, or position does not indicate much of practical value. The same applies to combined auscultation and scratching of the abdominal wall, which is merely a modification of the former method.

That the physical examination of the stomach has always been unsatisfactory is evidenced by the fact that for a long time recourse has been had to other methods of investigation. First among these may be mentioned, inflation of the stomach, the macro- and micro-scopic examination of the contents of the stomach, and, lastly, the chemical investigation of the stomach contents, and more particularly the enquiry as to

the presence of HCl free or combined in the gastric juice. This aspect of the subject need not detain us long as it is not of much practical value. The normal amount of free HCl in the gastric juice is .2 per cent., and its presence and amount are matters easy to determine. But what do they reveal? An excess of HCl constitutes a condition known clinically as hyperacidity, and is associated with spasm of the pylorus. On the other hand the absence of HCl has been observed in some cases of malignant disease of the stomach, and it has therefore been supposed, and advanced, that it is a sign of malignant disease of the stomach, and conversely that the presence of HCl in the gastric juice negatives the assumption of malignant disease. This teaching is fallacious and misleading. That free HCl is absent from the gastric juice in cases of cancer of the stomach cannot be denied, but it is so only after extensive destruction of the mucous membrane, and, if surgery is to be of any benefit in malignant disease of the stomach, it must be before the disappearance of HCl from the gastric juice, not after, when, in all probability, the lymphatics will be found extensively involved and a radical operation impossible.

The condition of the tongue in chronic indigestion is very misleading. It may be coated in simple conditions, which give way readily to medicinal treatment with or without change of air and suitable dieting, and it may be clean and in apparently normal in cases of simple ulceration, and even in cancer of the stomach. It follows that the condition of the tongue is worthless as an index of the state of the stomach.

After detailing all these symptoms and physical signs of chronic indigestion, we are far from having covered all the cases in which serious stomach lesions exist. There is an important class of cases, in which the patients suffer comparatively little inconvenience from indigestion, and in which the existence of a serious stomach lesion is first heralded by the occurrence of that appalling catastrophe, perforation, whereby the patient is struck down in a moment, and his life placed in jeopardy. These cases, because of the apparent absence of stomach symptoms, or the mildness of them, are often not recognised for some time after the perforation has



occurred, with the result that an operation holds out little hope of success.

#### THE CAUSES OF CHRONIC INDIGESTION.

In tabulating the causes of chronic indigestion no attempt is here made at a complete list ; simply those causes which have come under my own notice, either at operation or in the post-mortem room, are alluded to. Although outside the domain of this paper, it is necessary to refer to the condition of the teeth as one of the greatest importance. Foul teeth must be placed at the head of the list as a most prolific cause of indigestion and general ill-health. It is not necessary that the teeth should be extensively decayed, and silted up with tartar ; an equally potent, but less obtrusive, condition is pyorrhœa and gingivitis, with the secretion of pus round the fangs of the teeth, erosion of the alveolar margins, and recession of the gums. The association of foul teeth with chronic stomach trouble and gastric ulcer is a common enough experience. In using the term foul teeth it is not to be understood to apply to the natural teeth only, for very little observation will convince the most sceptical that behind a set of artificial teeth may lurk a vast amount of sepsis—an uncleanly state of things which is tolerated even by people who ought to know better.

*Causes.*—(a) Inside the stomach :—Ulceration, multiple, solitary, or malignant.

(b) In the stomach wall :—Fibrous thickening of the pylorus, cicatrices, hour-glass contraction, dilatation of the stomach, cancer.

(c) Outside the stomach :—Adhesions.

(d) Pyloric ulceration with or without stenosis.

(e) Duodenal ulcer.

(f) Hyperacidity and pyloric spasm.

(g) Gall-stones.

The relation of gall-stones to chronic indigestion would take us too far, and must be passed with the remark that, as a routine in all stomach operations, the gall-bladder should be examined and dealt with as occasion demands. In tabulating the causes in this manner, it must be admitted that the arrangement is crude, for it is a frequent experience that two or more of these conditions are present in the same case.

The diagnosis will be best explained by a few illustrative cases, and the conditions found at the operation can then be compared with the symptoms and signs on which the operation was undertaken in each case.

I.—R. J., æt. 43, complained that he could not keep his food down, of pain in the stomach when eating, and of weakness and loss of flesh. The illness had begun suddenly four months ago with vomiting, which had not been preceded by indigestion. Some days the patient would feel better, and then the vomiting would begin again. For the last three weeks, he had been unable to retain anything but small quantities of fluid. He had no pain except when eating, and if he did not stop at once with the onset of the pain he vomited. There had been no blood in the vomited matters. The tongue was coated. Physical examination: the stomach was not dilated, and there was no tumour to be felt. There were pain and tenderness to the right of the middle line midway between the xyphoid cartilage and the umbilicus, and hyperæsthesia and hyperæmia to the right of the middle line just above the umbilicus. A diagnosis of ulcer in the region of the pylorus was made. Operation revealed extensive malignant disease of the lesser curvature and posterior wall of the stomach. The abdomen was closed.

II.—R. J., æt. 41, complained of pain in the stomach and vomiting. The pain comes on from one to two hours after food, and he gets no relief till he vomits; the pain is often worse at night, and there is much flatulence. He has been suffering from indigestion and "liver complaint" for the last eight years, and, at one time, was unable to work for two years on account of stomach trouble. He now vomits large quantities of foul, brown, frothy stuff. If he does not vomit for two or three days, he then brings up a large quantity, but it is less foul, and less in quantity than if he had vomited every day. He has never vomited blood, and the tongue is clean. There are epigastric pain and tenderness to the right of the middle line, mid-way between the umbilicus and the xyphoid cartilage, hyperæsthesia and hyperæmia just above the umbilicus on the same side, dilatation of the stomach and splashing, but no tumour can be felt. A diagnosis of pyloric ulcer, pyloric stenosis, with dilatation of the stomach, was

made. Operation confirmed the diagnosis. Mayo's operation was performed, and the patient made an excellent recovery.

III.—E. R., æt. 41, complained of pain in the stomach and between the shoulders, coming on about an hour after food, and only relieved by vomiting. Has had pain in the stomach for the last ten years, and has been laid up for the last three months. A year ago, she vomited a large quantity of blood, and twice since then has vomited small quantities of blood. She is thinner than formerly, but is still well nourished. The tongue is clean, there are pain and tenderness over the whole of the subcostal angle, but most markedly over the pyloric region, hyperæsthesia and hyperæmia to the left of the middle line just above the umbilicus, but no tumour and no dilatation.

A diagnosis of ulcer in the pyloric region was made. At the operation several scars were found both on the front and the back of the stomach, one on the pylorus, and numerous perigastric adhesions. Mayo's operation was performed. The patient died on the tenth day from perforation of two ulcers, one on the front and one on the posterior wall of the stomach.

IV.—J. R., æt. 55, complained of pain in the stomach and inability to take solid food, with very little vomiting, and that only after solid food. The condition began ten weeks ago as indigestion, and has got rapidly worse; the patient is losing flesh, is getting weak, and is unable to work. There are pain and tenderness over the pyloric region, with hyperæsthesia and hyperæmia just above the umbilicus on the left side of the middle line, but no tumour and no dilatation. A diagnosis of pyloric ulcer was made. Operation revealed pyloric ulcer and adhesions. Mayo's operation was performed with complete relief of the symptoms.

V.—Mrs. D., æt. 30, complained of pain in the stomach which woke her up at night, and inability to take anything but slop food. Nine months ago she had an attack of pain in the stomach with vomiting, but no hæmatemesis, and she did not notice melæna. She has lost flesh, and has been suffering continuously during this time from "bilious attacks." The pain in the stomach is so great that she is unable to wear corsets. The tongue was furred, there were great pain and tenderness over the pyloric region, with hyperæsthesia



and hyperæmia just above the umbilicus on the left side, but no tumour and no dilatation of the stomach. A diagnosis of ulcer in the pyloric region with perigastric adhesions was made, and this was confirmed at the operation. Mayo's operation was performed with complete relief of the symptoms.

VI.—R. W., æt. 46, complained of pain across the lower part of the chest some time after taking food, which is relieved by taking more food. He has lost flesh, and has suffered much from flatulence during the last year. He does not vomit. The tongue is clean. There is a hard bossy tumour in the middle of the subcostal angle. It is movable, moves with respiration, and is tender on pressure. There is hyperæsthesia and hyperæmia just above the umbilicus to the left of the middle line.

The diagnosis of malignant disease of the stomach was confirmed at operation, which revealed enlarged glands along the upper border of the pancreas. The abdomen was closed after exploration.

A point of special importance is that in malignant disease of the stomach the disease has often made considerable progress before marked symptoms of indigestion are complained of, and I am convinced that the appearance of indigestion in an otherwise healthy patient past the middle period of life is, in many instances at least, an indication not of threatened stomach trouble, but that the disease has already taken a firm hold on the stomach, and further, that to dally with palliative treatment is to waste valuable time and to miss the golden opportunity when success might follow an operation.

Naturally, when medicinal and dietetic treatment have failed to give relief to a patient with chronic indigestion, one asks if surgical treatment is justified, and if so, what prospects it holds out of relief or permanent benefit. A careful study of over a hundred cases of this kind operated on, superadded to the experience of the last twenty years, leads me to the conclusion that chronic indigestion has always a physical basis for, at least, one factor in its production.

Let us take one or two examples to illustrate this point. A patient is suffering from chronic indigestion, with pain,

and vomiting of large quantities of more or less foul material. A careful examination fails to reveal anything more positive than dilatation of the stomach as shown by percussion and splashing with a tender spot and hyperæsthesia. If such a case is operated on, there will be found stenosis, due to ulceration, and consequent fibrous thickening. The pyloric orifice may be so narrowed that its lumen does not exceed the diameter of an ordinary pencil. There is a mechanical obstruction to the outlet of the stomach. This obstruction acts in two ways: first by diminution of the lumen of the outlet, and secondly by the replacement of the soft, flexible, and contractile pylorus by a rigid tube at which the peristaltic wave of the stomach stops. There is interposed into the peristaltic mechanism a node which completely separates the stomach from the duodenum. In such a case the pylorus may be free, but more frequently it is fixed to the anterior or the posterior wall, or to some neighbouring viscus. We are all acquainted with the conditions occurring in stricture of the cesophagus, where the obstruction is out of all proportion to the amount of narrowing, simply because the stricture interposes a node or interval in the peristaltic mechanism, and so breaks its continuity.

One other example. A patient is suffering from chronic indigestion; after taking food he has pain with or without vomiting. He has a tender spot where he feels the pain, and he has cutaneous hyperæsthesia and hyperæmia. There is no tumour or dilatation of the stomach. Operation reveals the scar of an ulcer with adhesions between the stomach and some neighbouring structure—the liver or the abdominal wall—or bands passing from one part of the stomach wall to another. This scarring, and these adhesions are very common. The perigastric adhesions produce pain when pulled on during peristalsis, and by their mechanical action and by the pain combined they break the peristaltic wave and make it irregular. Scars and adhesions, and for the matter of that active ulcers too, produce a node or nodes in the peristaltic wave, which may act mechanically in breaking the wave, and reflexly by inhibiting the motor impulses to the stomach muscle.

I have already stated that chronic indigestion has a physical basis as, at least, one factor in its cause, and it may be further

stated that for this reason chronic indigestion is a surgical disease. Because there is a mechanical defect, it must be dealt with by mechanical means. Another reason why chronic indigestion should be looked upon as a surgical disease is because of the great difficulty, in the present state of our knowledge, of diagnosing malignant disease of the stomach sufficiently early to be able to remove the growth. Doubtless a considerable number of the cases of malignant disease of the stomach must always be beyond the reach of surgical aid. At the same time, I feel sure that if chronic indigestion were looked on as surgical many cases of malignant disease of the stomach would have a better chance than at present obtains.

The surgical treatment resolves itself into two parts, first the examination of the stomach and adjacent parts of the duodenum and the gall-bladder. It is rarely necessary to open the stomach, the evidences of ulceration, scarring, adhesions, and malignant disease are sufficiently obvious outside. If malignant disease is present, it should be suitably dealt with, but it is well to remember that, though there may be a comparatively small growth in the stomach, and that fairly circumscribed, there may be considerable involvement of the glands along the pancreas and towards the portal fissure, the presence of which ought to negative gastrectomy. In malignant disease of the stomach without pyloric obstruction, gastroenterostomy is contra-indicated, and should not be done.

Secondly, the performance of gastrojejunostomy. This operation is a great advance on the many other surgical methods which have been practised, such as pyloroplasty, Fenny's operation, and is much better than the simple divisions of adhesions which readily re-form. The operation of gastrojejunostomy consists in making a permanent fistulous communication between the stomach and the jejunum, and it is essential that the communication should be of ample proportions, so that, even after some degree of contraction, there should be no probability of its becoming closed. The stoma, or new opening in the stomach, is usually made at the back of the stomach, and further, the part of the jejunum selected may be near its commencement, or at some distance below. This divides the operation into two classes. That with the opening at some distance from the commencement



of the jejunum has a loop of jejunum between its commencement and its junction with the stomach, and is called the loop method. That with the junction high up near its commencement has no loop, and is called the non-loop method. A further division is made according to the manner in which the jejunum is joined to the stomach, whether the peristalsis in the bowel is in the same direction as that in the stomach, the iso-peristaltic method, or in the opposite direction, the anti-peristaltic method. The loop method is practically always iso-peristaltic, whether the junction is made with the front of the stomach or with the back. The anti-peristaltic method is with the back of the stomach, and is the non-loop method of Mayo of Rochester.

The idea underlying the operation is to shorten the period during which the food is retained in the stomach and to diminish the amount of peristalsis, and by these two means to give rest to the stomach ; and further, in cases of duodenal ulcer, to provide a bye-pass, so to speak, so that the parts may be saved from the irritating effects of the gastric juice passing over them, and thus allowed to heal—being given, in a word, physical and chemical rest ; and, again, in the case of pyloric stenosis to provide a new outlet to replace the obstructed natural passage. In hyperacidity, the beneficial results are said to depend on the regurgitation into the stomach of the alkaline contents of the duodenum.

A great deal has been written, and still more said, about the actual part played by the stoma. It has been stated in all seriousness that after gastroenterostomy the stomach contents, except in cases of pyloric stenosis, are carried past the stoma and expelled into the first part of the duodenum, owing to the pressure during peristalsis being greater towards the pyloric opening. How the pressure can be greater at one part than at another I cannot say. One would have thought that any increase of pressure in an elastic bag like the stomach would have been equal all over. That used to be the teaching in years gone by. One thing, however, is certain, and can be proved at any operation, and that is that the moment the clamps are removed from the stomach the contents of that organ flow immediately through the stoma into the jejunum, and this is so whether there is

pyloric stenosis or not.

The questions to be decided are : Can any given case be relieved by medicinal and dietetic treatment within reasonable time and, if not, What are the prospects of benefit from surgical means ? The cases referred to are sufficient to justify or condemn the method of surgical interference, and I think that that method is not only justifiable but necessary. It gives complete relief from the symptoms suffered from by the patient, restores the nutrition to something nearer the normal, and permits the patient to resume his ordinary occupation. All these benefits cannot be obtained by the treatment previously carried out. As to the permanency of these benefits it is too early to speak, but the patients are thankful for the respite they now enjoy from the miseries which they have endured.

#### CONCLUSION.

In conclusion I would venture to emphasise the following points :—

1. That the old classification of the causes of chronic indigestion needs revision.
2. That, in many cases, the causes of chronic indigestion have a physico-mechanical basis.
3. That the position of the stomach in the abdomen renders clinical examination very unsatisfactory.
4. That gross lesions of the stomach in certain positions cannot be recognised clinically.
5. That, in many cases, grave lesions of the stomach do not produce alterations in the contour of that organ.
6. That the absence of palpable signs of disease in the stomach does not negative the existence of gross and grave disease.



A CASE OF PRIMARY LYMPHADENOMA OF  
THE SMALL INTESTINE.

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[With Plates VI. and VII.]

"LYMPHADENOMA is not very commonly seen in the intestinal tract" (Rolleston, *Allbutt's System of Medicine*, Vol. III.), and a case of simple adenia of the nature of that to be described is so rare as to render it worthy of record.

Sew Long, aged thirty, was admitted to the General Hospital, Kuala, Lumpur. He said that he had suffered from pain in the abdomen for two months with occasional vomiting. His bowels had not been moved for seven days (not uncommon in an opium smoker).

On admission, the man looked pale and wasted, and was obviously very ill. He had a dirty, dry furred tongue and a temperature of 100° F. His pulse was normal. On examination of his abdomen, a sausage-shaped tumour was found in the right iliac fossa. Its lower, outer, and inner edges were sharply defined, but above, towards the right hypochondriac region, the belly muscles were rigid, and the upper edge of the mass could not be determined. The tumour was not absolutely dull. It was rather tender and felt doughy. The abdomen was not distended, and was rigid only over the right side, especially just below the costal margin.

Per rectum the tumour could be felt by the finger. There were no physical signs of disease elsewhere. An enema was administered, and a very large quantity of hard fæces was evacuated. The tumour did not diminish in size. On the following day the patient vomited, and the pulse became rapid and small. An examination of the blood was made, which showed a slight polymorphonuclear increase. No leucocytosis was noticed.

A diagnosis of appendicitis was made, and laparotomy performed. The tumour was then found to be a large enteric intussusception, the intussusceptum gangrenous, and the sheath perforated. It was removed, and the gut united by end-to-end approximation over a bone tube. The patient died two hours after the operation.

*Necropsy.*—The intussusception was found to consist of jejunum. There was a second smaller intussusception in the





Fig. 1.—Large intussusception in jejunum.

A. Entering intussusception. B. Tumour at apex of intussusception. C. Cut edge of intussusception. D. Perforation in sheath of intussusception. E. Mucous covering edge of a plaque-like tumour. F. Umbilication at centre of tumour.

PLATE VII.



Fig. 2.—*Smaller intussusception in ileum.*

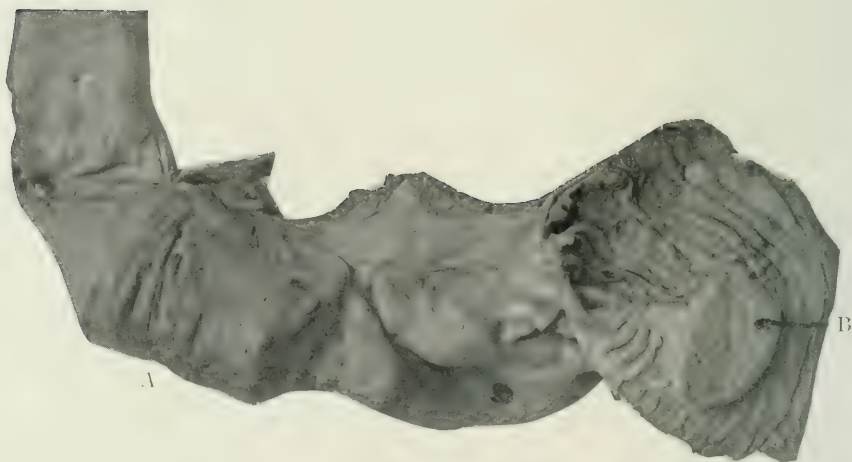


Fig. 3.—*Gut after removal of larger intussusception.*

A. *Bone tube in situ.* B. *Plaque-like tumour.*

ileum. The apex of each intussusceptum was formed by a sessile flattened plaque-like tumour. (*See* Fig. 1 and Fig. 3.) There were six of these growths in the lower jejunum and four in the upper part of the ileum. The tumour at the apex of the jejunal intussusceptum was the largest. There was one small plaque about 10 inches higher up, and the rest were contained in the succeeding 6 feet of intestine. The tumours projected into the lumen of the gut from its mucous surface, their edges were covered by mucosa, as shown in the accompanying photograph (Fig. 1). The flat surfaces of the plaques were uncovered by mucosa, and the centres of the larger tumours were umbilicated (*see* Fig. 1).

The growths varied in size from that of a shilling to that of a crown piece. They were oval in shape, their long axes being at right angles to that of the intestine (*see* Figs. 1 to 3). They were not situated at the mesenteric attachment of the gut, nor directly opposite to it, but were found at the side thereof. Peyers' patches were not enlarged, and there was no enlargement of the mesenteric or of other lymphatic glands.

The spleen and liver were not enlarged, but both were slightly cirrhotic. The kidneys were healthy. The contents of the thorax were free from disease.

Microscopically the plaques were found to consist of lymphoid tissue. The mucosa at the edge was thrown into folds, and ceased somewhat abruptly at the edge of the flattened surface, as shown in the photograph (Fig. 1). There were normal solitary lymphoid follicles close to the tumour.

The tumour itself was like an enormously overgrown solitary follicle, with certain differences in structure and position. In structure, it contained numerous bundles of unstriped muscle fibre, which radiated in a fan-shaped manner from the hilum of the tumour. The difference in position from the collections of lymphoid tissue, normally present in the intestine, lay in its invasion of the muscular coats. At the base of the tumour, the inner circular muscular coat of the intestine was shown in various stages of destruction; from invasion and splitting by a proliferation of small round cells near the periphery, to absolute destruction and disappearance near the centre.

The outer portion of the tumour, where it was covered by the mucosa, consisted of a coarser lymphoid reticulum containing glandular crypts, which appear in cross section. Towards its



inner part, nearer the central crater-like depression, the reticulum was closer, and contained unstriped muscular bundles. The tumours were evidently of the nature of lymphadenomata or lymphosarcomata. They appeared to be malignant in their invasion of the muscular coat, but benign in their circumscribed nature, and by reason of the freedom of the mesenteric glands from infection. They evidently belonged to that class of adenoma of the intestine which attacks "the lymphoid tissue in the mucous and sub-mucous coats, giving rise to the tumours which, though projecting into the lumen of the bowel, do not materially alter its calibre" (Rolleston, Clifford Allbutt's *System of Medicine*, Vol. III.). The growths probably originated in the lymphoid follicles.

Haktoen and Riesman say (*Text-book of Pathology*, Vol. II.) : "Lymphosarcoma occurs as a primary or secondary growth; the new growths start from the lymphoid follicles, but may begin independently of this."

In the case described there was no leucocytosis. On this point Ziegler says (Special Pathological Anatomy Article 38) : "In some cases associated with soft forms of lymphadenoma and of lymphosarcoma, the blood contains an increased number of colourless corpuscles. In other cases, this symptom is absent, and the disease is associated only with marasmus and general anæmia, or the blood may exhibit no demonstrable change. These cases are met with chiefly in connection with hard lymphosarcomata, though in some of them the soft variety is alone present."

(Article 208.)—"Such hypertrophic swellings are at times produced in the course of infective diseases, such as diphtheria, but they are often of mere local origin. They reach their greatest luxuriance in the affections described as simple and leukæmic adenia, whose causation is still unknown. In these affections, the follicles are replaced by bulky nodes and swellings, and by broad and flattened lymphadenoid patches, which, on section, have a marrowy pink or greyish white appearance."

The above description of "broad flattened lymphadenoid, patches," having a "greyish white appearance on section," describes the tumours in question, and definitely points to the case being one of simple primary adenia.

I wish to thank Dr. Fraser, Director of the Institute of Medical Research, Kuala Lumpur, for his kindness in preparing sections of the tumour.

## TWO CASES OF ACID INTOXICATION.

By T. GILLMAN MOORHEAD, M.D., D.P.H., F.R.C.P.I.,

*Physician, Royal City of Dublin Hospital.*

THE subjects of acidosis and of acid intoxication have of late years been brought prominently before the profession by numerous writers in the various medical periodicals, and their importance was recognised at the last meeting of the British Medical Association by their inclusion amongst the subjects selected for special discussion. As, however, many points in connection with the pathology and causes of the condition are still obscure, it may be of importance to put on record two fatal cases that have recently come under my notice, and of which one at least does not seem to fall under any of the hitherto recognised types of the disease.

The acids that have so far been isolated in cases of clinical acidosis are diacetic acid and  $\beta$ -oxybutyric acid, with both of which acetone is usually associated. Lactic acid also may at times be present in excess. Experimental work seems to prove however that the harmful influence is in all cases exerted by the acidity *per se* rather than by any special variety of acid.

Judging from the literature of the subject there is now practically universal agreement as to the origin of the acetone bodies from imperfect fat oxidation, though the actual cause of the defective metabolism probably differs widely in different cases. To von Noorden we owe the demonstration of the importance of carbohydrate starvation as a factor in leading to acetone production, but in some varieties of the disease no carbohydrate deficiency can be shown to exist, and in them it is necessary to assume that the failure of fatty metabolism is due to some toxin absorbed from the alimentary canal, or to the poison of the primary bacterial disease from which the individual affected may be suffering, or to some unknown cause. Normally the carbohydrates appear to provide the oxygen necessary for the complete oxidation of the fats into carbon-dioxide and water, though the proof of

this is as yet incomplete.

Von Jacksh classifies the conditions in which acid intoxication may be found under the following headings:—

- (1) Febrile ; (2) Diabetic ; (3) In cases of malignant neoplasms ;
- (4) In conditions of starvation ; (5) In certain psychoses ;
- (6) Dietetic ; (7) Post-anæsthetic.

It is probably within the experience of everyone that the febrile type is particularly common. Personally I have found both acetone and diacetic acid in the urine in cases of typhoid fever and rheumatic fever in adults, and acetone alone in typhoid fever, rheumatic fever, measles, scarlatina, and pneumonia. Von Noorden states that the acetone can almost at once be caused to disappear in febrile cases by increasing the carbohydrate in the diet, and regards these febrile cases as similar to diabetic ones, in which, whether carbohydrates are being taken or not, carbohydrate starvation may exist by reason of the glycosuria. At any rate its presence does not appear to have any special significance.

Concerning most of the other varieties of acetonuria and aciduria referred to in the above classification, I do not wish to speak, but I may state in passing that it is now agreed that transient acetonuria may and frequently does follow anæsthesia by any form of anæsthetic without necessarily giving rise to any disquieting symptoms. Some months ago, in a routine examination of the urine passed by operation cases before, immediately after, and 24 hours after the operation, I detected a trace of acetone in 6 out of 21 cases in the urine first passed after operation. In no case was acetone present before the operation, and in only one case could a reaction be obtained 24 hours later. In one of the six cases in which acetone was present, a distinct but transient diacetic acid reaction was also obtained. More recently a case of post-anæsthetic acid intoxication, with severe symptoms, presented both acetone and diacetic acid in the urine in large quantities, but the symptoms disappeared within 48 hours under treatment by larger doses of alkali, and rectal injection of a solution of dextrose.

The cases, however, that have impressed me most, and that I wish now briefly to record, are as follows:—

A. L., a girl, aged 16, was admitted to hospital on March



20th, into the surgical wards suffering from a large cystic goitre. The goitre was apparently a family disease, as the patient's mother, two sisters and one brother were also the possessors of similar tumours, and two of them, the brother and one sister, had already been operated on by my colleague, Mr. R. A. Stoney, for the relief of pressure symptoms.

The patient herself, I am informed, had at the time of admission a very myxœdematous appearance. She was extremely stupid and slow of speech, and was abundantly covered with subcutaneous tissue. On March 28th, Mr. Stoney operated, and removed the entire right lobe of the thyroid gland, the isthmus and the lower portion of the left lobe, the anæsthetic used being ether, and the entire operation lasting about  $1\frac{1}{2}$  hours. After the operation, there was a little bronchitis, which lasted for three or four days, and was accompanied by a slight rise of temperature, but this subsided very quickly.

There was at no time any sign of suppuration in the neighbourhood of the wound, but a little thyroid secretion was noticed escaping from the lower angle of the incision where a drainage tube had been inserted. Five or six days after operation there was a slight attack of tetany, and again a few days later there was a severe attack, ushered in by coughing and hawking up of thick mucus, and accompanied by profuse sweating and typical painful carpo-pedal contractions. It was during this attack that I first saw her, and a complete examination of the urine at this time showed it to be perfectly normal.

On the next day the patient was quite well, and as there was no return of the attacks of tetany I did not see her again till nearly a month later, on May 4th. Mr. Stoney informs me that during the interval the patient remained quite well though dull and stupid, and that the operation wound healed completely except for a small pin-hole sinus at the lower angle of the incision, which discharged a few drops of serous exudate daily. The temperature throughout was normal; the patient was up and about, and on normal diet during the latter half of the time. On May 2, without any apparent cause, she developed a severe headache and did not sleep on that night.

The next day she became drowsy and gradually passed into a state of coma, and accordingly on the morning of May 4th,

I was again asked to see her. She was then in a state of deep coma ; the pupils were dilated and did not react to light ; most of the deep reflexes were absent ; the heart sounds were feeble, and the pulse almost imperceptible ; no other symptom or sign of importance was noticed except that the breath had an unmistakable odour of acetone, and that a catheter specimen of urine gave an intense acetone and diacetic acid reaction. A trace of albumen was present, but no sugar. Large doses of bread soda per rectum and by the mouth through a tube were at once ordered, and it was intended to follow this up by enemata containing dextrose, but as the sphincters were completely relaxed nothing could be retained in the bowel. In addition, every possible form of stimulation was employed but nothing proved of any use, and death occurred a few hours later. On the day before I had seen her several injections of saline solution had been administered to her subcutaneously and per rectum.

On the following day I performed a complete post-mortem examination, the results of which may be briefly summarised :—Brain and spinal cord macroscopically normal ; lungs, heart, liver, spleen, suprarenals, and pancreas normal microscopically and macroscopically ; alimentary canal normal, except for the presence in the small intestine of eleven round worms ; kidneys, slight parenchymatous inflammation ; thyroid gland—a considerable portion of the left lobe was present, and microscopically presented the ordinary appearance of a cystic goitre. In the extreme lower portion a small abscess containing inspissated pus and communicating with the surface by means of a small sinus, was found. The entire abscess surrounded by a wall of dense connective tissue was about the size of a pea. No parathyroid glands were found, although a careful search was made, and sections were cut from several structures, all of which proved to be lymph glands. An incomplete blood examination made just before death showed nothing abnormal.

From the findings at the post-mortem examination I am left absolutely in the dark as to the cause of the dramatic onset of the acid intoxication in this case, and of its rapidly fatal termination. I would call particular attention to the following facts :—(1) The patient was on a normal diet for over a fortnight prior to the onset of symptoms. (2) The liver

presented no evidence of fatty infiltration or of degeneration, unlike the condition described as being typical in cases of delayed anæsthetic intoxication. (3) The onset of symptoms was more than a month after the anæsthetic, and on the one occasion that the urine was examined in the interval, it was found to be normal. (4) No gastro-intestinal symptoms were present, and it hardly seems possible in consequence that the round worms can have been in any way the cause of the acidosis. (5) In spite of the presence of a small abscess in the thyroid, there was no evidence of septic absorption, as the temperature had been normal and the general health good in the interval between the second attack of tetany and the onset of the fatal symptoms. (6) It has been suggested to me that the fatal issue may have been really due to a deficiency of thyroid secretion, and that the acidosis was merely a secondary phenomenon. Against this supposition is the fact that the portion of thyroid left behind was much larger than the normal thyroid gland.

After a search through the literature I have been unable to discover any record of a case similar to the above, and I now briefly report it in the hope that it may lead to the publication of similar cases, if such exist.

My second case had an equally dramatic termination, but as no necropsy could be obtained, it is unnecessary to refer to it in great detail. The patient was a nurse, aged 28, whom I was asked to see late in the evening of September 28, on account of the sudden onset of severe vomiting and diarrhœa. She stated that she had been feeling ill since before her holidays which she had taken in the month of August, and that, in particular, she had suffered from nausea after food and from general lassitude. I had known her well previously, and had observed a marked change in her colour since her return to work in the hospital in September. She had become a deep sallow colour, and she looked extremely anæmic.

On examination the yellow colour was found to be universal, with deeper pigmentation on the forehead, beneath the eyes, and around the nipples. There was no pigmentation of the mucous membranes. The pulse was extremely feeble, 104 to the minute, and there was some cyanosis of the ears, hands, and feet. The general appearance was one of profound col-



lapse, but nothing abnormal could be detected on examination of the thorax or abdomen, save weakness of the cardiac sounds. A small quantity of urine was obtained, and was found to be free from albumen, sugar, and from diacetic acid. I did not at this time test for acetone. The temperature was subnormal.

On the next morning I saw her before 8 a.m., and found that she had passed a fair night, and that the vomiting had ceased. She was still, however, extremely ill, and as I had to be out of town that day, I asked my colleague, Dr. Parsons, to see her in case any serious change took place. Accordingly, as the vomiting and diarrhœa recurred during the afternoon, Dr. Parsons saw her, and then found that the urine gave a marked acetone and diacetic reaction. He also was unable to detect any organic lesion. Saline infusions and bicarbonate of soda were freely administered during the next twelve hours; but, as the patient was much worse on the next morning and was becoming comatose, I determined on giving the alkali intravenously, and, with the assistance of Mr. Stoney, introduced a drachm of bicarbonate of soda dissolved in a pint of normal saline solution into the median basilic vein. A temporary improvement resulted; but a few hours later the coma returned, and death took place in the evening, forty-eight hours after the acute onset. A blood examination made on that morning gave a count of only 2,700,000 red cells. There was marked poikilocytosis, but no nucleated red cells were present; hæmoglobin 40 per cent.; white cells normal; the alkalinity of the blood was not determined.

On first seeing this case, the probability of its being Addison's disease occurred to me, and I am still, in the absence of further evidence, of that opinion. Whether the acidosis was primary or secondary to the gastro-intestinal symptoms, I am quite unable to state. However that may be, the terminal symptoms of complete collapse, cyanosis, drowsiness, and coma, constitute the typical symptoms of acid intoxication, and it is with a view to calling attention to this as a probably frequent terminal event, that I now report the case.

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## MENTAL DEFICIENCY IN CHILDREN.

By JAMES DUNDAS, M.B., D.P.H.,

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THIS subject has lately become of greater interest to the profession as a result of the medical inspection of school children.

In the past the existence of the village idiot was taken as a matter of course. He was pitied, philanthropy provided for him, more or less—usually less—his acts were condoned, but beyond that no interest was taken in him. He was not regarded as a member of a large class, as an expense to the community, and one of the chief sources of our gaol and workhouse population.

In recent years these facts have been gradually recognised, and we have now in the Defective and Epileptic Children Act and in school medical inspection real means of tackling the problem. It has been estimated that there are 50,000 mentally defective children in the elementary schools of England and Wales. When these figures are pondered, when it is realised that these children are incapable of benefiting by instruction in elementary schools, are a drag on the rest of the class (on the principle that the speed of the fleet is that of the slowest ship) and a danger to the community, the gravity of the situation comes home to one.

Most men coming to this work have probably seen very little of these cases, for, indeed, they seldom appear in the hospitals, nor are they the kind of cases "final" men expect to meet. This paper is intended to lay down some broad lines for the guidance of these men.

Mental deficients are legally defined as children "who not being imbecile and not being merely dull and backward are defective, that is to say, by reason of physical and mental defect are incapable of receiving proper benefit from the instruction in the ordinary public elementary schools, but are not incapable, by reason of such defect of receiving benefit from instruction in such special classes or schools as are in this

Act mentioned."

Imbeciles are "those persons who by reason of mental defect existing from birth or from an early age are incapable of earning their own living, but are capable of guarding themselves against common physical dangers."

An idiot is a "person so deeply defective in mind from birth, or from an early age, that he is unable to guard himself against common physical dangers."

These, then, are the three great classes of mental cases that one meets with in children, and the task of properly differentiating them is by no means easy. There is a group, probably as large as these three combined, and which may be labelled "backwards," which provides the chief difficulty. The first question one asks then in seeing a case is: Is this merely a "backward," or is it a mental deficient, using the term for the moment as applying to the three classes "mental deficient," "imbeciles" and "idiots"? This is a question of prime importance. Special schools are intended for deficient, not "backwards," and further, children entering these schools are retained till the age of sixteen. In addition, to label a "backward" as a mental deficient is doing a gross injustice to a child. It places a permanent stigma upon him.

The ætiological factors of backwardness may be considered here. The parents are often casual labourers, persons of no fixed abode and vagrant habits. They are often unemployed, or even unemployable. The children are frequently illegitimate, the progeny of a brothel. They are badly clad, badly fed, and filthy. Regular habits and attendance at school are not enjoined, the latter, indeed, is often evaded. It is possible, then, to get a child of ten, eleven, or even twelve, of this type incapable of doing infant-room work, though, on account of his size, he may have been passed up into the mixed school. He may not know his own age, fails at the simplest arithmetical questions, and can read only the shortest words. His attention is bad, his manners vicious, and his whole aspect one of dulness and mental vacuity. Off hand, such a child is labelled as a mental deficient, which may be far from being the case. The truth is, certain of his nervous tissues are uneducated and unused, but there is no lesion interrupting his association fibres. On the other hand, he may be far down in the scale of "backwards," on the borderland of deficiency



He may be unable to learn to read or write with any proficiency, or profit much by education in the ordinary sense of the term. Still, according to Tredgold, "If, in spite of his mental dulness, he seems intelligent enough to follow an occupation, and to look after his interests with ordinary prudence, then he is not defective." Such cases often find their way into special schools for mental deficient and show marked improvement, so much so that they resume their places successfully in the ordinary schools. The true mental deficient does not do this. His condition is incurable. The treatment of backwardness is obvious. An improved environment is often sufficient, with skilled teaching according to their condition. Fortunately the new Children's Act gives power to remove children from unsatisfactory surroundings and guardians. Undoubtedly many of this type, under the care of institutions like Barnardo's Homes or the Salvation Army, have become useful citizens and colonists.

In considering the differential diagnosis, we are mainly concerned with the borderland cases, the slight degrees of deficiency, and the grave degrees of backwardness. The differentiation of these three degrees of deficiency is not so important for the officer at work in a school. The main features of the deficient child will now be touched on.

On inspection one notes short stature, which is coupled with subnormal weight. There are certain obvious and frequently present deformities, of the cranium, micro-, or macro-, cephal, or the sugar-loaf type ; large, flabby, protruding, or small and imperfect ears ; squint and high-arched palate. A "stand easy" attitude is adopted ; the child is listless and dull, possibly ignores his inspector, and his attention is with difficulty obtained and retained. Or he may display a monkey-like activity, cunning, and suspicion. His mother gives a history of late dentition, that he did not walk till he was four, nor speak till he was five or six, that he suffers from cold hands and feet, and frequent indigestion. His teacher will tell of dirty habits, of cunning and deceit, of fierce outbreaks of temper and murderous attacks on his fellows, showing a serious loss of any sense of right and wrong.

The next step is to endeavour to estimate his mental attainments and possibilities, and little can be done here unless one gains the child's confidence, or at least does not induce his

antipathy. Try him with simple calculations, try his reading powers, show him a picture in his reading book and get him to tell what he sees there. In this way it will be found that his attention wanders on the slightest provocation, and that he is very unstable and readily moved to tears, anger or laughter. His speech is halting and often monosyllabic. He has little sense of the beautiful or of reason, and is devoid of ideas. In this fashion one secures data to decide whether he is incapable of receiving benefit from instruction in an ordinary school, and whether he has intelligence enough to follow an occupation, or look after his affairs—in short, whether he is deficient or not.

The above description applies to the large majority of cases. They are the progeny of insane, epileptic, alcoholic, and tuberculous parents. There is a distinct hereditary taint about them. Their condition is congenital, and dates from birth. There remains, however, a small group not so originated. Their deficiency, or amentia, in its varying degrees, is acquired. They suffer either from some anatomical brain lesion, or the necessary trophic stimuli, *via* the blood and nerves, are imperfect or missing, a condition analogous to the changes induced in a limb or organ whose blood or nerve supply, or both, is interfered with. As regards the anatomical brain lesions, epilepsy, the zymotic fevers, and intra-cranial inflammation are the causes. Pathologically, sclerosed patches, cerebral softening, cystic areas, etc., are formed, and, clinically, the signs correspond to the site of the lesion.

Possibly more interesting are the cases due to absence of adequate circulatory and nervous nutriment. Cretinism is the outstanding example of the first of these, though cretins can hardly be classified among the less severe grades of mental deficiency. The thyroid secretion, distributed by the bloodstream, is absent, and impaired nutrition throughout the body results. In common with the rest of the body brain development is retarded or inhibited. As these cases usually begin early, under one year of age, mental development is lacking from a very early stage. These cases are therefore true samples of amentia. The appearance of the child suffices for diagnosis. The face is large, pale and sallow. The eyelids are puffy, the nose thick and flattened. The abdomen is prominent. The figure is squat, the legs short and the walk is characteristic.

Fortunately in the exhibition of thyroid extract we have now the means of coping with these cases—a most glorious and remarkable triumph for therapeutics.

There remains the important group due to lack of nervous nutrition, the lack of sensory stimuli—a group for which the school medical officer should keep a careful look-out. In the past many of these cases, through lack of early recognition, have found their way into asylums for the insane. Through sheer mental starvation brain atrophy or amentia has been the result. In other words these are cases of permanent mental disablement in which one or other of the great afferent tracts is out of action. In consequence they suffer from a bankruptcy of ideas, which, maintained for a time, becomes a condition of permanent mindlessness. Educated and mentally fed through the remaining afferent routes deterioration is prevented. Indeed we may say that amentia in this type of case is preventable.

Take the case of the deaf-mute. He does not hear, therefore he does not learn to speak. All the vast array of stimuli through the ear are lost to him; he lacks the help of his auditory centre and the reproduction of sounds through his motor-speech mechanism is too much for him. So true is this that should a child of five or six become deaf he will become dumb. These children are only potential aments. Caught early and trained in a deaf and dumb school the brain quickly expands and takes on its normal function. A large number of dumb children belongs to this class. They are distinct from the dumbness one finds in the idiot who is dumb because he has nothing to say, and the aphasic idiot who has a motor mechanism lesion.

Such cases, then, are illustrations of amentia from lack of mental impressions. A living illustration of what these cases may become is Ellen Keller, the American lady, who suffered in this way and has given us most illuminating accounts of her own mental development under careful instruction.

Closely allied to these cases are the word-deaf cases. They hear sounds and words but interpretation of them is impossible. Speech to them is a mere jargon. They differ from the adult aphasic. His condition is one of retrogression. He has usually some auditory memories left, and his motor-



speech centre has been trained and is sound, not so the word-deaf child.

To test these cases is no mean task for the medical inspector. The functions of the various speech, auditory and visual centres and their connecting fibres must be tested individually and in combination. First of all, the existence of other conditions, such as deafness and blindness, must be excluded.

It is well to begin with the auditory centre. If it is healthy the child will hear and understand what is said to him. If he speaks his motor-speech centre is sound, and if he replies to a question the fibres linking up his auditory and motor centres are intact. The message to the ear has been received and interpreted at the auditory centre, flashed to the motor-speech centre and thence out to the musculature. Various lesions may interrupt these communications. Thus, if the break is at the auditory centre word-deafness is the result; if between the auditory and motor centres the patient cannot reply to the words spoken though his power of speech still remains to him. A lesion peripheral to the speech centre implies loss of power of articulation. In the last two cases he knows what he wants to say but cannot say it.

Then comes the visual centre. In the child of school age the message travels from the eye to the visual and thence to the auditory centre before being transmitted to the speech centre. A lesion at the visual centre means word-blindness, and the child cannot read. A lesion on the commissural fibres between the visual and auditory centres would prevent the child reading aloud. It should be pointed out, that it is only in educated adults, strong "visuals," where reading can be performed independently of the auditory centre.

These points can be tested by speaking to the child, first to see whether he understands, and then to obtain a proper response. Similarly, the capacity to pick out words and name them demonstrates the integrity of the visual-auditory-motor arc.

There remain the interesting lesions affecting writing. This is controlled by the motor-speech centre and the centres for the muscles of the hand, a combination of Broca's convolution with the neighbouring motor centres. In addition the auditory and visual come into play and they may be tested on the lines already laid down.

## MOUNTAINEERING AND HEALTH.

WHEN John Addington Symonds, suffering from consumption, announced his intention of pitching his camp in the high Alps, Sir William Jenner warned him that, if he did so, he would infallibly leave his "vile body" in the hands of the Swiss doctors; and it might be hard to find a case in which so great a physician has made himself responsible for so inaccurate a prognosis. Symonds did not, indeed, recover—his lesion was too far gone for that; but he did at least live, enjoying good health on the whole, for 15 years after he had been told that the first cold he caught would be fatal to him. Nor did he live merely in order to "cure" in a hammock or an invalid's chair. On the contrary he engaged in tobogganning and other winter sports, and even climbed a little, according to the measure of his strength. The proof is clear that the doctor who is to pronounce on the relations between mountaineering and health needs a working knowledge of mountains as well as a working knowledge of medicine.

The fact of the matter is, of course, that mountaineering—or residence in the mountains when actual mountaineering is out of the question—affects not only the metabolism of the body, but also the emotions of the mind, which, equally of course, react on the metabolism aforesaid; and, indeed, there could be no more striking illustration of the fact than that which John Addington Symonds' case furnishes. He was a man of highly strung temperament, much troubled by the riddle of this painful earth, and very prone to those "spiritual crises" which sometimes end in religious mania. It is hardly too much to say, as every reader of his biography will agree, that the high Alps saved him from the perils to which the habit of excessive introspection had brought him very near.

All his spiritual crises occurred when he was near the sea level, albeit in climates commonly reputed to be healthy. One of them overtook him at Clifton, and another fell upon him at Cannes. His letters from these places, on these occasions, were morbid, hysterical, and sometimes very nearly insane. He not only balanced the pros and cons of the

Comtian and Hegelian philosophies; he also balanced the pros and cons of suicide. Yet he always had a confidence at the back of his brain that he would be better, and more at ease with himself, if he climbed the Alps; and his confidence, when he did climb them, was always justified by the consequences. The letters in which he relates his progress towards higher altitudes show the remedy to have been a specific and the relief instantaneous. The weight of the spiritual burden diminished *pari passu* with the diminution of the atmospheric pressure. After being tormented on the plains by his inability to believe in a Personal God, he invariably found consolation in Pantheism on the heights.

This does not prove, of course—and is not here cited as proving—that the Pantheistic explanation of the universe is the true one. What it does prove is that mountain scenery and mountain air have an influence at once sedative and tonic; and that is the note which we find struck in the writings of all mountain enthusiasts from the earliest times. For the multitude, indeed, the mountains were, in the old days, merely disagreeable obstacles which had to be passed in the journey from one “smiling plain” to another; but the elect always knew better. Professor Conrad Gesner, for instance—he who, in 1548, formed the resolution “to climb one mountain every year”—knew a great deal better.

“There is nothing here,” he said, when he went up Pilatus, “to annoy the ears, nothing to importune them—no tumults or noises from the cities, no brawls of men at strife. Here, from the lofty mountain crests, in a deep and solemn stillness, you will seem to hear the very harmony (if there be such a thing) of the celestial spheres.”

That is exactly John Addington Symonds’ experience, albeit presented in the simple and unsophisticated language of the seventeenth century; and if any one wants a further example of the same sentiment, he may find it in the writings of Bourrit, the so-called Historiographer of the Alps.

Bourrit was precentor of the Geneva Cathedral towards the end of the eighteenth century; and he went to the mountains and climbed as high as he could, every summer, as a matter of routine. He could not, he said, “comprehend the motives which had induced mankind to choose for their domicile the



low-lying places of the world"—places which he regarded as "receptacles for all the filth that came from the sky and the mountains"; and, climbing at a time of civil dissension almost amounting to civil war, he observed with a specially triumphant satisfaction the tranquillising effect of mountains upon agitated tempers.

"At Chamonix," he writes, "I have seen persons of every party in the State, who imagined that they loathed each other, nevertheless treating one another with courtesy, and even walking about together. I have observed such people at the foot of Charmoz, forget their rivalries, help each other on their way, exchange ideas, and even be reconciled to one another. Returning together to Geneva, and encountering the reproaches of their several friends, they merely answered in their defence: 'Go, as we have gone, to the Montanvert, and take your share of the pure air that is to be breathed there; look thence at the unfamiliar beauties of nature; contemplate from that terrace the greatness of natural objects, and the littleness of man; and then you will no longer be astonished that nature has enabled us to subdue our passion'."

A great deal of the case for mountaineering as a hygienic measure is expressed in those quotations, and it may be left to casuists to argue whether the mountaineer feels good because he is well, or gets well because he is feeling good. A more important question is whether the advantages of the recreation have been increased or diminished by the facilities which funiculars and other mountain railways afford for its indulgence.

The true mountaineer, of course, hates the railways, though he seldom fails to use them; and certainly no objection shall be raised here to the endeavours of the Society for the Protection of Swiss Scenery to prevent their too rapid and too unsightly extension. In proving that they can run trains to the top of the Jungfrau, the Swiss engineers have done enough for honour, and their recent attempt upon the Matterhorn may fairly be described as an act of profanation. There is another side to the medal, however, and though no one but an engineer, or a railway contractor, or a speculative investor, wants to see a railway map of the Alps looking like a plan of the London tubes, there is something to be said for the lines which exist at present, especially from the point of view of

men who, like most medical men, have only short holidays to dispose of, and wish to make the most of them without undue bodily exertion.

Thanks to the mountain railways, the highest mountain hotels are a good deal higher than of old, and at the same time better provisioned than of old. The climber enjoys, therefore, a comfortable base of operations from which to climb, and to which to return after climbing; and he no longer lives, as did the climbers of previous days, in constant terror of being poisoned by tinned viands, high chamois, and stale fish. That is one advantage; and another is that one can nowadays, if one chooses, sleep in the valleys and spend one's day upon the heights—a great consideration to travellers liable to insomnia, though one which members of the profession who send their patients to the Alps are apt to overlook.

Insomnia, indeed, is one of the chief evils risked by those who sojourn at high altitudes; and no hard-and-fast line can be drawn as to the altitude at which the risk begins to be serious. Everything, or nearly everything, depends upon individual ideopathy. Some men can sleep and snore in the highest of the refuge huts; others begin to be restless as soon as they get above 3,000 feet. Stories are told of visitors to the Bel Alp who have been absolutely without sleep for a week or more, but have fallen into deep slumber on the backs of their mules on the way down to Brieg; and there are plenty of people with whom the difference between sleeping at Saas-Fee and Saas-im-Grund, about a thousand feet below, is precisely the difference between a bad night's rest and a good one. Hence the attraction, in certain cases, of a valley station from which several mountain railways radiate.

Interlaken, which has been called the Clapham Junction of the Bernese Oberland, is one station of the kind. One starts thence for Lauterbrunnen, for Grindelwald, for the Wengern Alp line, for the Schynige Platte, for Beatenberg, etc. One can easily go to any of these places and back in the course of the day; while if anyone desires to see a funicular which is really and unquestionably a boon and a blessing to mankind, he has only to travel by the line, opened last summer, to the Harder Kulm.

The Harder is at the extremity of one of the mountain

ridges which border the Lake of Brienz. It used to take four hours to walk to the top—a thing which no one ever took the trouble to do because the path was very steep and a thick pine forest obstructed the view. Nowadays one is lifted to the top in about 20 minutes, refreshes oneself at the railway station buffet, gets clear of the trees in another quarter of an hour, and may spend the rest of the day rambling along the ridge, in a blazing sunshine, tempered by a cool breeze, at an elevation of some six or seven thousand feet, with the dark waters of the little lake immediately below, and the highest snow peaks of the Bernese Oberland immediately opposite. It is not exactly mountaineering; the elements of danger and difficulty are absent—though there is just one point at which nailed shoes are essential to safety; but all the emotions proper to mountaineering, except those of anxiety and terror, can be obtained there.

Nor need any reader fear that September is too late a month for the enjoyment of the mountains. On the contrary, according to many experienced travellers, the Alps are then at their best. The weather is more dependable in the first half of September than at any other season. The ferocity of the sun has spent itself, but its genial glow remains: and most of the mountains—not excluding the highest and most difficult—can be ascended just as easily then as earlier. The shortening of the days may be a drawback; but there are plenty of compensations.

And, finally,—a word to the wise in case they do happen to strike unfavourable weather; let no man hastily assume that the weather all over the country is the same. It often happens that the sun is shining in the Valais when the rain is drenching the Oberland; and there are parts of the Valais—Montana and some other places to the north of the Rhone valley—in which it hardly ever rains at all. The traveller who wants to know what the weather is like at any one of them at any given moment has only to ring up some responsible person on the telephone and enquire. Having got his answer, he can shape his plans accordingly.





## Notes from Foreign Journals.

### MANGANESE AS A TONIC.

Guido Piccinini recommends manganese in the treatment of anæmia and of chlorosis, either by itself or in combination with preparations of iron.

1.  $\mathcal{R}$  Manganisii Carbonatis - - - gr. iss.  
 Extracti Gentianæ,  
 Sodii Bicarbonatis,  
 Pulveris Glycyrrhizæ - - - ana q.s.

Pro pilula i.

"Two to four to be taken at meals."

2. The *albuminate of manganese* is given in pills or in solution in a dose of from 45 to 75 grains.

3. The *citrate of manganese and sodium* is given by hypodermic injection  $\frac{3}{4}$  of a grain to 3 grains in solution.

4.  $\mathcal{R}$  Ferri Sulphatis - - - - 3vj.  
 Manganisii Sulphatis - - - - 3ij.  
 Sodii Bicarbonatis - - - - 3iv.  
 Aquæ - - - - 3ss.  
 Glycerini - - - - 3iss.  
 Melis - - - - 3j.  
 Pulveris Acaciæ - - - - 3vj.  
 Pulveris Tragacanthæ - - - - gr. xxx.

"To make 4-grain pills."

(*Revue de Thérapeutique médico-chirurgicale.*)

### TREATMENT OF ATONIC DYSPEPSIA.

Rummo recommends a liqueur-glassful of the following before each meal:—

- $\mathcal{R}$
- Extracti Fluidi Kolæ,
- 
- Extracti Fluidi Cocæ,
- 
- Extracti Fluidi Cinchonæ, - - - ana 3iiss
- 
- Sodii Glycerophosphatis.
- 
- Calcii Glycerophosphatis - - - - ana 3iij.
- 
- Pepsini Hydrochlorici - - - - 3iss.
- 
- Sodii Arseniti - - - - gr. iss.
- 
- Strychninæ Sulphatis - - - - gr.
- $\frac{1}{2}$
- .
- 
- Syrupi Menthæ Piperitis,
- 
- Syrupi Vanillæ - - - - ana 3ij.
- 
- Tinct. Aurantii - - - - ad 3xxxv.

"To be filtered twenty-four hours after mixing."

(*La Riforma Medica.*)

### REMEDY FOR THE PAIN OF INSECT-BITES.

Moloney describes a treatment which at once relieves the pain of bites from mosquitoes and gnats, and the stings of wasps and bees, all of which produce much pain and discomfort. He has used for some time past iodine in saponated petroleum (30 to 40 grains to the ounce). A few drops of this rubbed over a mosquito-bite acts as by magic. The pain from stings is quickly relieved.—(*Therapeutic Gazette.*)

**TREATMENT OF CONSTIPATION IN GYNÆCOLOGY.**

Constipation is of frequent occurrence among women, especially those suffering from gynæcological affections. It is often aggravated by the abuse of laxatives and purgatives. Consequently all medicines which increase intestinal atony must be stopped. The use of electricity should be ordered; faradic currents, high frequency, Franklinic sparks, induced Franklinic currents, and especially galvanism, together with active movements of abdominal gymnastics. The patient should be advised to go to stool regularly, and small enemata of cold water should be given at first. If the constipation is obstinate, a dose of castor-oil must be given every four days. When this line of treatment is not sufficient, the nervous system must be treated by means of psychotherapy, small doses of bromides, and warm baths. The diet must be rich in fruits and in farinaceous food.—(*Revue de Thérapeutique méd.-chir.*)

**THE CHIEF CAUSES OF MORTALITY IN DIPHTHERIA SINCE THE INTRODUCTION OF SERUM TREATMENT.**

At the Académie de Médecine, Louis Martin showed that, in spite of the serum treatment, the mortality from diphtheria still remains important. Many patients do not gain benefit early enough from this method of treatment. One-third of the children, who die in hospital, succumb in less than 24 hours after admission, not having received an injection of serum in their own homes. It is necessary to intervene quickly, and at once to inject every patient suspected of diphtheria. Children, under two years of age, die in the proportion of 20 per cent. in spite of anti-toxin. They come, as a rule, from infected localities, and the disease can be warded off by preventive injections. In effect, every child, who has been in contact with a case of diphtheria, ought to be injected preventively. The majority of other patients succumb to toxic symptoms, which are usually attributed to nervous lesions. In most of such cases, Martin has observed symptoms of renal, hepatic, and especially adenal inadequacy. These toxic symptoms will be prevented by putting in force, at the outset, in seriously affected throat-cases, an intense anti-toxic treatment, and by re-inoculating convalescents, who show symptoms of intoxication.—(*Le Progrès Médical.*)

**BROMIDE OF CAMPHOR FOR HYPODERMIC INJECTION.**

Cassin and Girard make use of sterilized olive oil, previously washed in alcohol, for these injections, and divide the solution into ampullæ of 1 c.c., each containing 10 grammes (2½ drachms) of camphor mono-bromide. It has been used with complete success in cases of psychical excitement in the course of typhoid fever, in psychical disorders after menorrhagia, in syphilitic affections of the brain, and in painful and permanent contraction of the flexors of the neck in a case of paralysis agitans. For this last case three injections were enough to relieve the contraction. In a case of uncontrollable vomiting of pregnancy these injections were made alternately day by day with injections of physiological serum, and they quieted down the stomach in a week.—(*Revue de Thérapeutique méd.-chir.*)



## Reviews of Books.

*Common Affections of the Liver.* By W. HALE WHITE, M.D., F.R.C.P., Senior Physician to and Lecturer on Medicine at Guy's Hospital. Pp. viii + 302. London: James Nisbet & Co., Ltd. 4s. 6d. net.

OUR thanks are due to those whose persuasions induced Dr. Hale White to publish these lectures. The book most assuredly needs no apology for its appearance, as it is a welcome addition to medical literature. It represents, as Dr. Hale White very truly says, clinical teaching, but it is clinical teaching of a very high order. Dr. Hale White has the gift—none too common—of lucid teaching, which makes it at once a pleasure and a profit to hear what he has to say. When to this gift of teaching are joined careful clinical observation, a philosophical use of pathology, and a wealth of practical experience, it is obvious that the blend will be a particularly happy one.

It is very certain that the student, for whom the book is intended, beginning his work, will find it of exceedingly good value. It is equally certain that the student, immersed in practice, will also very greatly benefit by reading and digesting the whole it. We have no scruples in suggesting more of these excellent lectures.

*A Text-book of Diseases of the Ear.* By MACLEOD YEARSLEY, F.R.C.S., Senior Surgeon to the Royal Ear Hospital; Medical Inspector to London County Council Deaf Schools, etc. Pp. 452. Figures 128. London: Kegan Paul, Trench, Trübner & Co., Ltd. 18s. net.

THIS text-book is certainly one of the most valuable of those recently published upon the subject of diseases of the ear. It is written by one who has had a large clinical experience, who has read widely, and who is a keen observer. The work is prefaced by a most useful and well-illustrated chapter on the Anatomy and Physiology of the Ear. Throughout the book cases are quoted in illustration, a feature which materially adds to its clinical value, while the references are so numerous as to render the book of the greatest possible utility to those practitioners who are working at Aural Surgery. For the general practitioner, however, Chapter XII. will be found to be exceedingly important, as it deals, in an exhaustive manner, with the influence of such general diseases as the infective fevers, nervous diseases, circulatory, respiratory, and digestive diseases, etc., upon the ear. The illustrations are all well reproduced, and the book appears to be remarkably free from errors.

*An Alabama Student, and other Biographical Essays.* By WILLIAM OSLER M.D., F.R.S., Regius Professor of Medicine, Oxford; Honorary Professor of Medicine, Johns Hopkins University, Baltimore. Pp. viii + 334, with two portraits in photogravure and other illustrations. London: Oxford Medical Publications. 7s. 6d. net.

THE value of the study of biography as an aid to mental training has always been recognised by the highest educational authorities, but it is doubly valuable when it can be undertaken as a mode of mental recreation.



Hence it is scarcely possible to conceive of a more helpful and pleasant pastime, for a physically jaded and mentally wearied medical practitioner, than an occasional half-hour devoted to Professor Osler's admirable volume. By admitting his colleagues, both in America and in this country, into pleasurable by-paths, which must have been delightful refreshment to him, he has conferred upon them an incalculable benefit, and one can understand, by perusing these essays, with what renewed mental vigour the Professor would have returned to the deeper studies of his special work.

The study of the essays on American physicians must excite a keen interest in the minds of Englishmen, while the accounts of others, whose names are classical, will appeal to all.

The easy, attractive, and, in many cases, eloquent style, in which all these essays are written, will at once arrest attention, and they are all of such absorbing interest that it would be almost invidious to select any for special commendation or review. Still, we think that many readers, and we venture to think that these will be numbered by thousands, will be especially delighted with "An Alabama Student," "Sir Thomas Browne," and the Harveian Oration.

*A System of Medicine.* By eminent Authorities in Great Britain, the United States, and the Continent. Edited by WILLIAM OSLER, M.D., F.R.S., Regius Professor of Medicine in Oxford University, Honorary Professor of Medicine in the Johns Hopkins University, Baltimore, etc.; assisted by THOMAS McCRAE, M.D., F.R.C.P., Associate Professor of Medicine and Clinical Therapeutics in the Johns Hopkins University, Baltimore. Vol. V. Pp. 903. London: The Oxford Medical Publications.

THIS volume deals with the diseases of the alimentary tract, and is in every way as excellent as the four already received. The chapter on the diseases of the mouth and salivary glands is written by Dr. David Riesman, and in it he calls attention to the important work by Dr. William Hunter on the relation of oral sepsis to pernicious anæmia. Dr. Riesman rightly says that "the general practitioner, as a rule, pays too little heed to the condition of the teeth." This chapter is illustrated by five beautifully coloured plates. Organic diseases of the stomach are dealt with by Dr. Charles F. Martin, and we consider that the section, dealing with gastric and duodenal ulcer, is especially good. The section on the diseases of the intestines is contributed by Dr. Alfred Stengel, and that on diseases of the peritoneum by Dr. Humphry Davy Rolleston. Dr. Eugene L. Opie contributes an exhaustive article on the diseases of the pancreas, while the final chapter on diseases of the liver, gall-bladder, and biliary ducts is written by Dr. A. O. J. Kelly. This chapter contains a very useful list of references to existing books which deal with the diseases of the liver.

*Aids to Pathology.* By HARRY CAMPBELL, M.D. Lond., B.S., F.R.C.P. Lond.; Lecturer at the Polyclinic; Senior Physician North-West London Hospital, &c. Pp. 184; illustrations 10. London: Baillière, Tindall & Cox. 3s. 6d. net.

DR. CAMPBELL has endeavoured, in this little book, to give a brief and concise account of the known facts in pathology without producing an exhaustive treatise. He has certainly succeeded in his object, and the book

should prove most useful to the student before attacking the larger works, provided that it is confined to these introductory purposes, and is not allowed to usurp a place which it is neither meant nor fitted to fill. The section on the kidney is excellent, and the closing chapter on immunity and opsonins gives a very clear résumé of the leading facts in this branch of work, which is growing in importance and interest. The busy practitioner should find the book of great benefit.

*The Diagnosis of Small-pox.* By T. F. RICKETTS, M.D., B.Sc., M.R.C.P., D.P.H., Medical Superintendent of the Small-pox Hospitals and of the River Ambulance Service of the Metropolitan Asylums Board. Illustrated from photographs by J. Byles, M.B., B.C., F.R.C.S., D.P.H., Senior Assistant Medical Officer at the Small-pox Hospitals of the Metropolitan Asylums Board. Pp. xvi + 154. 12 coloured plates, 110 black and white plates, and 14 charts. London: Cassell & Co., Limited.

THIS book was commended in our hearing, by one of the leading authorities on infectious diseases, as being far and away the best thing done on this particular subject. With the book itself before us, we are able more fully to appreciate the force of remark. The book is in many ways remarkable. It deals solely with the diagnosis of small-pox, and embodies the points which Dr. Ricketts has been teaching, notably as regards diagnosis from distribution, for some years past. The masterly manner, in which the subject is handled, is manifestly due to acute, untiring, and discriminating observation applied to a wealth of material. The illustrations are not the least noteworthy feature of the book; they are numerous, but it would be a hard task to reject even one as being unnecessary.

*An Index of Treatment.* By various Writers. Edited by ROBERT HUTCHISON, M.D., F.R.C.P., Physician to the London Hospital and Assistant Physician to the Hospital for Sick Children, Great Ormond Street; and H. STANSFIELD COLLIER, F.R.C.S., Surgeon to St. Mary's Hospital, Joint Lecturer on Surgery in St. Mary's Hospital Medical School, Surgeon to the Hospital for Sick Children, Great Ormond Street. Pp. xvi + 926. Illustrations 53. Fourth edition. Bristol: John Wright & Sons, Ltd. 21s. net.

"Good wine needs no bush." This is a generous vintage, but has been thoroughly well matured. The first edition appeared in November, 1907. Exactly one year later the fourth edition appears. It has been revised throughout, and some good new articles have been added. The popularity of the work has been well earned, and well deserved in every respect. We wish it continued success in its sphere of real usefulness and helpfulness.



## Practical Notes.

STROPHANTHUS, DIGITALIS, AND NITRITES IN HEART DISEASE.—Digitalis is by far the most powerful of the drugs in ordinary use for diseases of the heart, and in the light of the newest teaching in regard to the physiological principles to be followed in medical treatment, especially concerning cardiac rhythm, further scientific investigation is needed. In unsuitable cases, digitalis may cause deplorable results, for, besides its action on the heart, this drug has a pronounced effect upon the blood-vessels, causing vaso-constriction, and, therefore, a rise of blood-pressure. Dr. Langdon Brown puts the whole case very well when he says, in his teaching on physiological principles in treatment, that it is to be hoped that in time it will be generally realised that it is as rash to give digitalis without taking the blood-pressure as it is to give morphia without examining the urine. There is no doubt that at present digitalis is prescribed frequently for a heart that is failing behind a pressure that is already excessive, the fact being overlooked that the administration of strophanthus is preferable if the blood-pressure be distinctly raised, for this drug has a similar cardiac effect to digitalis, but a much smaller vascular one. Supposing, however, that a medical man persists still in using digitalis in such a case, then he should remember that a nitrite must be given also, so as to act as a vaso-dilator. It has been clearly shown by Cushny that in such a case the best results are secured by frequent small doses of nitro-glycerine, which need not be administered for some hours after the digitalis; the reason for this is that the action of digitalis sets in rather slowly, and persists for a long time, whilst nitrites act rapidly, but are excreted comparatively soon. It is worth noting, incidentally, that, in the experience of Dr. Langdon Brown, of all drugs in the treatment of heart-block, strychnine yielded him the most striking beneficial results, and the improvement followed its exhibition so frequently and so speedily that the benefit cannot be regarded as a mere coincidence.



THE SERUM TREATMENT OF ERYSIPELAS.—Antistreptococcic serum has been tried in the treatment of erysipelas, but the results obtained hitherto are not entirely conclusive, failures having been recorded on numerous occasions. The above is from the teaching of Dr. R. W. Marsden, formerly Medical Superintendent of the Monsall Fever Hospital, and his opportunities for making accurate observations have been of the most ample description. In his opinion, it is possibly advisable that streptococci from more than one case of erysipelas should be used in the production of the serum; he also considers that large doses up to 100 c.c. are to be recommended; he further points out that since the streptococcus is present at the advancing margin of the inflammatory area, numerous attempts have been made, by the injection of antiseptics, by scarification, followed by the use of antiseptics, as well as by local constriction or cauterisation, to destroy the microbe locally, or prevent it from spreading in the lymphatic spaces. The disappointing result of all this work is summed up well and tersely in the following words of Mr. Marsden:—"It may be said that all these methods are of no avail." Though this is a somewhat depressing result, improvement can often be secured by means of one of the following local applications: ichthyol ointment 10 to 50 per cent., lead lotion compress, glycerine poultice, or a compress of 1 in 20 sodium salicylate, combining with this last the administration of quinine and salicylate of soda on alternate days. Dr. Marsden carefully mentions that whichever topical remedy is selected it must be kept in constant and close contact with the skin. Perchloride of iron has long held its place as a valuable internal remedy in erysipelas, and increasing doses of this remedy have been recommended during the acute stage of an attack of erysipelas. On signs appearing of cardiac failure, or severe prostration, stimulants may be used freely.

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MEDICINAL TREATMENT OF RICKETS.—In spite of the fact that hygienic and dietetic measures constitute the chief means of dealing with the treatment of rickets, nevertheless by the judicious use of suitable drugs the medical man can

influence favourably the course of this disease. This aspect of the subject in the present-day fashion of advocating only the latest scientific up-to-date theory is apt to be overlooked, and it is satisfactory to note how Dr. Colbeck, in his teaching on the subject, gives the following formulæ for rickets, after fully recognising the claims of dietetic management and hygienic surroundings :—

R Syrupi Ferri Iodidi - - ʒss.  
Ol. Morrhuæ - q.s. ad ʒii.

Two teaspoonfuls to be taken three times a day after food.

R Ol. Phosphorati - - ʒss.  
Ol. Morrhuæ - - ʒi.

One teaspoonful to be taken three times a day after meals.

R Ol. Morrhuæ - - ʒx.  
Syrupi Calcii Lactophosphatis,  
Liquoris Calcis - - āā ʒxxv.

One teaspoonful to be taken three times a day after meals.

R Sodii Hypophosphitis - - gr. v.  
Calcii Hypophosphitis - - gr. v.  
Ferri Hypophosphitis - - gr. ii.  
Sodii Bicarbonatis - - gr. v.  
Spiritus Chloroformi - - ʒxv.  
Aquæ Camphoræ - q.s. ad ʒi.

One teaspoonful to one tablespoonful to be taken three times a day.

R Calcii Hypophosphitis - - gr. ii.  
Syrupus Ferri Phosphatis - - ʒss.  
Syrupi - - q.s. ad ʒi.

One teaspoonful to be taken three times a day.

R Syrupi Ferri Phosphatis - - ʒi.  
Syrupi Ferri Iodidi - - ʒi.


Two teaspoonfuls to be taken three times a day.

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FALSE TEETH AND SORE THROAT.—An instructive and interesting instance of the valuable aid to be afforded by a correct and minute observation of symptoms and their treatment

is to be found in the teaching of Dr. James Mackenzie, who describes a form of sore throat connected with the use of false teeth. A number of patients may complain of pain on swallowing, and when careful investigation is made, it will be found to be due to a form of infection very common amongst those who use false teeth, where the utmost cleanliness is not observed. The patient frequently complains of a sore throat, and if the fauces be inspected, a slight redness of the pillars can be detected. If the patient wear a plate on the roof of the mouth, and this be removed, the underlying mucous membrane will be found swollen and red, and from this place to the fauces there can be detected an extension of the inflammation in the form of small red dots. Sometimes the surface of the mucous membrane under the plate may be covered with patches of thrush, and an infective process may extend to the parotid and sub-lingual glands, causing severe inflammation and swelling.

PEMPHIGUS.—The successful treatment of a troublesome attack of pemphigus may be a matter of some difficulty, especially when the crops of bullæ appear on the mucous membranes, and the good effect of opium must be borne in mind when these membranes are affected in a bad case in an elderly person. Provided the effect on the patient is carefully watched, arsenic may be administered in increasing doses, always provided that there is no derangement of the digestive system; in this respect cod-liver oil and general tonics are useful. For the local treatment there is a good deal to be said for continuous tepid baths in the severe cases. Much can be done by pricking the "blebs," and then applying carbolic acid lotion (1 in 20) on lint, or else a dusting powder, calamine liniment, or an ointment.





## Preparations, Inventions, Health Resorts, etc.

### FLAVOURED SANATOGEN.

(London : The Sanatogen Company, 12, Chenies Street, W.C.)

We have received from the Sanatogen Company a sample tin of their new "Flavoured Sanatogen" recently placed upon the market. A great point in favour of any preparation for the use of invalids is its palatability, for it is clear that, although a food may be very valuable and undoubtedly form a powerful nerve tonic, its usefulness nevertheless depends upon its being able to be readily and well borne, even by a very delicate stomach, especially in the case of invalids whose digestive faculties are impaired. The Sanatogen Company having realised that there were many invalids and children who were so fastidious in regard to taste that medical men frequently had trouble in getting them to take sanatogen, went to work to overcome the objection, and have now produced the present flavoured form. This change is certainly an important one, and we can recommend the new preparation as being so daintily flavoured that it will suit the palate of the most fastidious invalid or child. The improvement will be welcomed widely, for the therapeutic value of the preparation has been demonstrated by clinical experience, and its beneficial influence on nutrition and digestion has been recognised as rendering it of great use in very many lines of treatment. Sanatogen can still be obtained unflavoured, the price and size of the packing of both the flavoured and unflavoured being identical.

### VERONAL-SODIUM.

(London : E. Merck, 16, Jewry Street, E.C.)

Samples of veronal-sodium prepared by Mr. E. Merck have been submitted to us. The substance is freely soluble in cold water, and therefore lends itself to administration in the form of mixtures or draughts which cannot be prepared with veronal alone on account of its comparative insolubility in water. The easy solubility of veronal-sodium has the additional advantage of rendering the product particularly adapted for rectal and hypodermic administration. On this account also, its action is markedly more prompt than that of veronal when given by the mouth in the form of powders and tablets. Veronal-sodium is

supplied in powder and tablets, the latter prepared with a cocoa basis. The therapeutic action of veronal-sodium being identical with that of veronal, the exhibition of the former is indicated in special cases where an easily soluble preparation is required.

“SOLOID” PRODUCTS FOR IONIC MEDICATION.

(London: Burroughs Wellcome & Co.)

Specimens of “Soloid” Ionic Sodium Chloride, “Soloid” Ionic Zinc Sulphate, and “Soloid” Ionic Potassium Iodide have been received by us from Messrs. Burroughs Wellcome & Co. The old method of treatment known as cataphoresis or ionic medication has been recently reintroduced and is recognised to have a distinct field of usefulness. It is finding increasing vogue in this and other countries. The treatment consists essentially in the electrolytic dissociation of drugs, the dissociated ions having the power of penetrating the skin and reaching the deeper tissues. Drugs intended for absorption applied in the form of liniments or ointments penetrate the skin with difficulty, but by means of electrolysis they can be introduced with comparative ease. These “Soloid” products have been introduced to facilitate this method of treatment. Each “Soloid” product contains 4.37 grains, and when dissolved in one fluid ounce of water gives a one per cent. solution. Solutions containing one or two per cent. of the active ingredient are usually employed in ionic medication. These “Soloid” products will be found reliable and efficient.

ADRENALIN TABLETS. ADRENALIN AND NOVOCAL TABLETS.

(London: Parke Davis & Co., Beak Street, W.)

Specimen tablets of adrenalin, and adrenalin and novocaine have been prepared by Messrs. Parke Davis & Co. Each adrenalin tablet contains  $\frac{1}{200}$  grain of adrenalin and is therefore of the same therapeutic value as 5 minims of the 1:1000 solution. They are put up in tubes of 25 tablets which are not only convenient for carrying, but also preserve the properties of the drug. For obtaining a prompt physiological effect, one or more of the tablets, as may be required, may be placed under the patient's tongue whence the drug is rapidly absorbed, or may be dissolved in sterile water and administered hypodermically or intravenously. The tablets are also useful for adding to solutions of cocaine or other analgesic for topical or sub-

cutaneous administration in order to avoid pain and bleeding in minor surgical operations. The adrenalin and novocaine tablets are supplied in two strengths. No. 187 dissolved in 15 minims of water forms a 2 per cent. solution of novocaine with 1 of adrenalin in 3000. No. 188, in the same quantity of water, forms a 1 per cent. solution of novocaine with 1 of adrenalin in 6000. Experience proves that stock solutions of adrenalin and novocaine are not so efficient as those made at the moment of use. These tablets therefore are convenient and offer an efficient means of employing novocaine, which is said to be the equal of cocaine in anæsthetic power and considerably less toxic, in association with the valuable isojæmic properties of adrenalin in surgical operations.

#### THE LOOP DEVELOPER.

(Leeds : Jonas Woodhead & Sons.)

We have received a loop developer from Messrs. Jonas Woodhead & Sons, together with a pamphlet describing the instrument as being intended for the "development of the chest, lungs and muscles." The loop is made of spring steel and is fitted with handles so that when the apparatus is used the muscles concerned in the movement are put in tension, the degree of which varies with the amount of force used. The developer should undoubtedly prove of value.

#### PEEBLES AS A HEALTH RESORT.

Medical men when advising patients as to a health resort are often confronted with the difficulty that patients will not go to any Continental resort and, instead, demand information concerning some suitable place in Great Britain. The town of Peebles has certainly earned the right of being mentioned among the health resorts in Great Britain, and its claims to the enjoyment of a climate possessing a rare degree of immunity from fog and dampness cannot be passed over. The town is more than 500 feet above sea level, it is surrounded by gentle slopes and hills on every side, and rejoices in a pure and bracing atmosphere. A Hydropathic and Kur Hotel capable of accommodating over 300 guests constitutes an important feature, and it is claimed that the baths at this institution are unrivalled in completeness. So far as the medical side is concerned the establishment is under the control of a physician.





## Notes by the Way.

The British  
Medical  
Association.

THE 77th Annual Meeting of the British Medical Association was held in Belfast during the last week in July. Many members of the Association attended the gathering, and the presence of the Lord Lieutenant of Ireland and the Countess of Aberdeen throughout the proceedings rendered the occasion memorable in the annals of the Association. A large number of distinguished foreign medical men were entertained by the citizens of Belfast, whose hospitable labours were most fully appreciated. We congratulate all concerned upon the success of the meeting.

\* \* \* \*

Is it R.I.P.  
?

BUT what has *really* become of the proposed Charter?

\* \* \* \*

Coley's Fluid.

THE occasion of the visit of Dr. W. B. Coley was taken full advantage of by the medical profession in this country, and Dr. Coley will not easily forget the enthusiastic reception accorded to him by the distinguished audience that crowded the large hall of the Royal Society of Medicine to hear him deliver an address on the treatment of sarcoma by Coley's fluid. A large number of those present had had unsuccessful results in cases treated with the preparation of bacterial toxins known as Coley's fluid, and the closest attention was paid to that part of the address in which Dr. Coley explained how much success depended upon a judicious determination of the dosage for a given case. He always begins with one-fourth of a minim diluted with sufficient boiled water to ensure accuracy of dosage, and injects systematically either into the buttocks or pectoral region. After the individual's susceptibility has been ascertained, one can then inject into the tumour itself if it is in an accessible region. The initial dose into the tumour should always be not more than one-fourth of that used elsewhere. It was a good plan to give the injections alternately into the tumour and into the buttocks. Daily injections should be given, increasing by one-fourth of a minim until the desired reaction, namely, a

temperature of  $102^{\circ}$  to  $104^{\circ}$  has been obtained. This should be modified to suit patients in a weakened condition. Having secured this reaction the dose should not be further increased, unless and until it fails to give a reaction, when it can again be increased by one-fourth to half a minim.

\* \* \* \* \*

#### Why Some Fail.

THE reason why so many medical men regard the use of Coley's fluid as useless was explained thus:—Occasionally the physician has heard of the mixed toxins in cases of sarcoma, and if he has read of the method he has probably forgotten the details, and has little faith in its value. Now and then a surgeon is found who takes the time to give the matter special thought, and who is willing to give the patient the benefit of a trial with the toxins. He begins with some fears and more doubts, and when he sees the patient in one of the severe chills, sometimes with marked cyanosis, very rapid and feeble heart action with a temperature of  $103^{\circ}$  to  $105^{\circ}$ , he hesitates to go on or is unable to instil into the patient the courage and confidence so necessary to enable him to continue the treatment to a successful termination. Dr. Coley denied in the most emphatic manner possible that his treatment was empirical and referred to the laboratory investigations that had enabled him to standardise his fluid and secure the success of his treatment in suitable cases.

\* \* \* \* \*

#### Atoxyl Amblyopia.

FOR some time there have been statements current that the administration of atoxyl was not unattended with risk, and two cases have now been reported by Paderstein, in which a peculiar form of blindness was observed in the patients concerned. The matter has aroused especial attention in America, and the *Medical Record* in commenting on the subject states that the condition begins usually after the drug has been taken for several weeks and starts with some impairment of visual acuity, with a marked narrowing of the visual field, especially on the nasal side, going on to complete scotoma. It is also noted that a central scotoma develops according to the severity of the attack, which

apparently does not bear any proportion to the amount of the drug taken. According to the reports of the cases the disease is always bilateral, and in the worst cases there may be a definite optic atrophy. The question is undoubtedly a very serious one, and the recognition that the drug is capable of producing in exceptional circumstances an affection of the eyes—which may be but a dimming of a part of the visual field or complete blindness—undoubtedly carries with it the necessity for a thorough investigation. When it is remembered that the drug is used as a remedy in sleeping sickness and for syphilis the gravity of the matter will be appreciated.

\* \* \* \*

#### Electric Anæsthesia.

THE work in connection with electric narcosis has recently been supplemented by some interesting investigations carried out by Dr. Louise G. Robinovitch. In her opinion, amongst the advantages obtained by using electric anæsthesia in laboratory work is the fact that no animals have been lost from this method. A voltage of from 5 to 10 is all that is required to produce electric anæsthesia and this secures the animal from danger to life. Dr. Robinovitch has also made public a very curious observation in regard to this electric method, for she has succeeded after animals have been electrocuted in restoring spontaneous respiration by means of rhythmical electric excitations. The practical bearing of this may be inferred from further investigations in which animals after syncope has been induced by chloroform or ether, have been resuscitated by means of the electric current. The application of the results of this work is of course difficult to appraise, but the problem is one that will undoubtedly excite world-wide notice amongst scientific men.

\* \* \* \*

#### International Medical Press Association.

THE Association of the British Medical Press, one of the national branches of the International Medical Press Association, held a meeting at the offices of THE PRACTITIONER on August 10. Amongst those present were the Editor of the *Lancet*, the Editor of the *British Medical Journal*, Mr. A. Smith, Dr. Armit, and the Editor of *The Practitioner*.





# THE PRACTITIONER.

OCTOBER, 1909.

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## ON BEING TIRED.

BY SIR LAUDER BRUNTON, BART., M.D., D.Sc., LL.D., F.R.C.P., F.R.S.,  
*Consulting Physician, St. Bartholomew's Hospital, etc.*

I HAVE chosen as the title of my paper "On Being Tired" rather than "On Fatigue," because the word "fatigue" carries with it the idea that some previous exertion has produced it, while many people are tired without any exertion whatever. For brevity's sake, however, in the course of this paper I may possibly use the terms "being tired," "fatigue," or "weariness" as interchangeable.

One constantly hears the complaint from patients that they are "always tired," and indeed some people avoid working on the ground that they are "constitutionally tired." Other people term them simply lazy, but it is quite possible that, in many of these cases, there is some physical condition in the person which renders exertion specially distasteful to them, although other people cannot observe it. I remember perfectly well an eminent medical professor, who was acknowledged to possess brilliant abilities, but was accused by his friends of being lazy. It was only when he died, at a comparatively early age, from heart disease, which had been present for a number of years, that some of his friends, who had previously blamed him, were willing to admit that there might have been some excuse for his laziness. Like hunger and thirst, tiredness is a systemic sensation, although, just as hunger has its local seat in the stomach, and thirst in the mouth and throat, fatigue has it more especially in the eyes and muscles. Hunger, thirst, and fatigue are amongst the overpowering sensations of the body, and fatigue may be so great as to overpower the other two, and to prevent the sufferer from obtaining the food and drink which would have relieved him. Excessive weariness is so painful that it destroys

the desire for life. This is well expressed in Tennyson's words :

I am a'weary, a'weary,<sup>1</sup>  
I would that I were dead.

The external manifestations of weariness appear both in the face and general attitude. More especially do the signs of weariness appear in the eyes, which lose their lustre. The

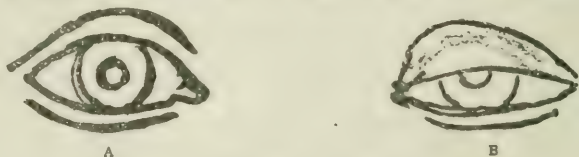


Fig. 1.—To show effect of fatigue on the eye.

A. Vigorous and alert. B Wearied.

eyes seem to sink into the head, and the eyelids droop so as to lessen the palpebral opening (Fig. 1). The muscles of the face become relaxed so that the lower jaw tends to drop, and, although it may not do so to such an extent as to open the

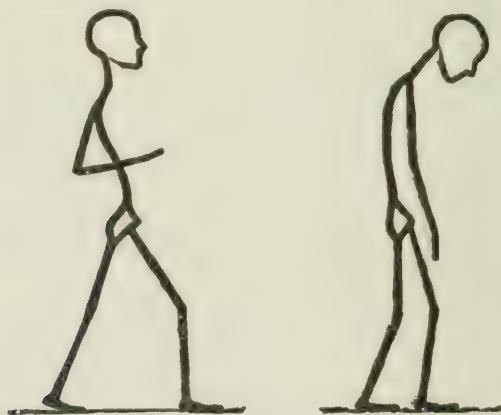


Fig. 2.—Energy and Fatigue.

mouth, it yet gives the face a drawn look. The other muscles of the body also become relaxed, so that the head tends to droop, the back to bend, the arms to fall helplessly down, and the knees to bend under the weight of the body (Fig. 2). The sensibility of the sensations is also blunted. Sight and hearing are less acute, and the sensibility of the skin is so much impaired that Professor Griessbach has found that the distance at which two points of a pair of compasses applied to the skin are felt as a single impression may be used as a

<sup>1</sup> Tennyson's *Mariana*.

measure of fatigue. For this purpose he uses an æsthesiometer, which consists of a pair of compasses, the points of which are applied to the skin at greater or less distances. When the two points are close together they are of course felt as one, but the distance between them must be increased to an appreciable amount, varying with different parts of the body, before two distinct impressions are perceived. With increasing fatigue, the points may be removed further and further from one another before the double impression can be noted. The amount of fatigue can also be estimated, perhaps more accurately still, by the contractile power of muscles, but this takes a longer time. In Waller's dynamograph two handles kept apart by a strong spring are brought together by a grasp of the hand, and the movement is recorded on a slowly revolving cylinder.<sup>1</sup>

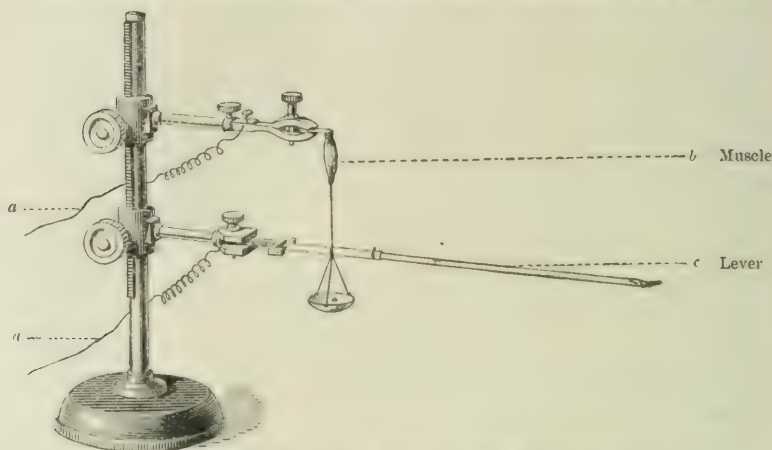
Although, as we shall presently see, weariness may be produced by a number of causes, yet the most frequent is excessive muscular exertion. Over-exertion in a muscle causes it gradually to lose its power of contraction, until, finally, it cannot contract at all, and so movement either of the body or limbs becomes impossible.

But so long as muscles are connected with the central nervous system, the complete exhaustion of the muscle is impossible, for before it becomes paralysed by its own exertion the sensation of fatigue is perceived by the nerve centres, and the nervous stimuli which proceed to the muscle are so much diminished that complete paralysis is never produced. The sensation of fatigue is a central sensation. It is observed in the central nervous system, but it is produced by peripheral causes. One of these is muscular exertion, another is mental exertion. It may seem odd that I should class mental exertion as a peripheral cause of the sensation of fatigue, but I think it may be properly so denominated, as the part of the brain used in mental work is outside of, or apart from, that part where the sensation of fatigue is perceived. The effect of exertion on isolated muscles has been chiefly examined in the case of the muscles of the frog. One end of the muscle is fixed in the pincers, the other end is connected with a lever which is drawn up by every contraction, and this writes on a revolving cylinder. When the muscle is caused to con-

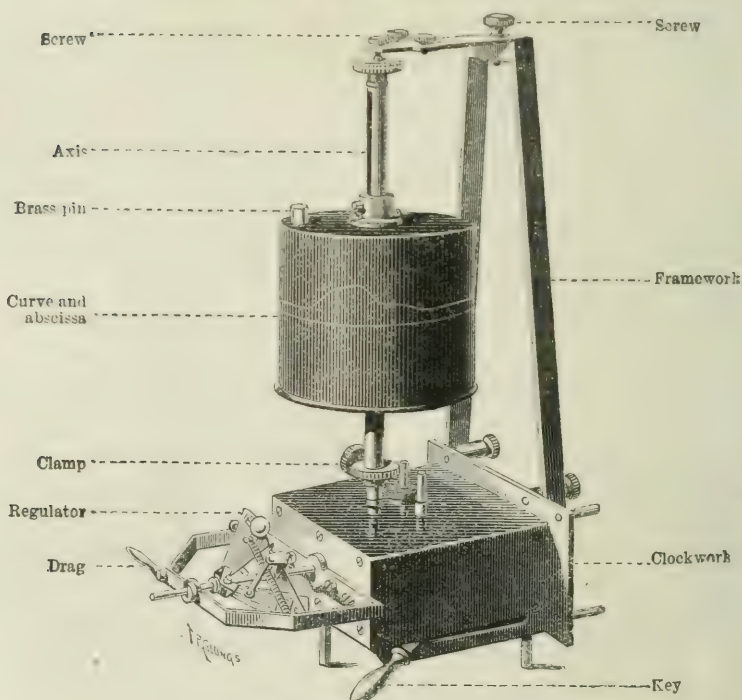
<sup>1</sup> Waller : *Human Physiology*, 1891, p. 339.



tract at regular intervals by an electrical stimulus, the intensity of which remains the same the contractions become gradually



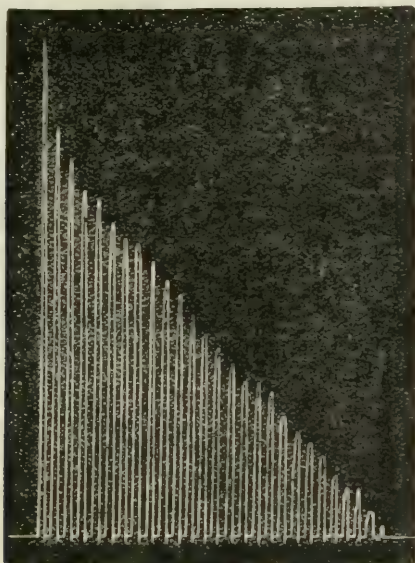
A.—Muscle-lever. a, a. Wires for stimulating the muscle.



B.—Revolving cylinder on which the lever writes.

Fig. 3.—Recording Apparatus for Muscular Contraction.

less and less until they cease (Fig. 3). Professor Kronecker has found that when this occurs the tracings of the series differ



Figs. 4 and 6.

*After Mosso. Exhaustion curve of finger in healthy man where the muscles are caused to contract by electrical stimulation. This curve is so nearly the same as that of an excised muscle stimulated at regular intervals that the same figure does for both.*

so greatly in height that their upper limit forms a straight line (Fig. 4). A somewhat similar condition is observed in the muscles of man when they are made to contract by the local application of an electrical stimulus (Fig. 6). The apparatus (Fig. 5)

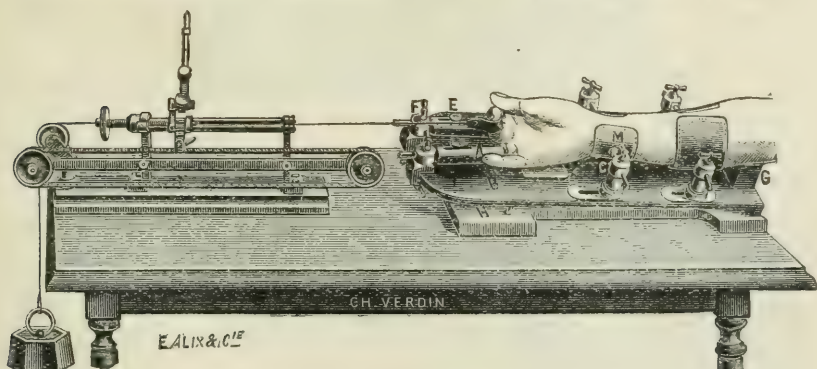


Fig. 5.

*Mosso's Ergograph.*

by which this observation is made is called the ergograph. It consists of a string running over a pulley, and having at one end a weight and at the other a loop into which the finger can be passed. Each time the finger is bent the weight is raised, and, by having attached to the string a recording point, tracings can be obtained on a revolving cylinder in the same way as was done with the frog's muscle. When the muscle is caused to contract, not by the direct application of electricity to it, but to the nerve supplying it, a different curve is obtained in which the line of fatigue is not straight, but is curved in a manner which would almost seem to indicate that the nerves become more sensitive to the stimulus before the fatigue becomes

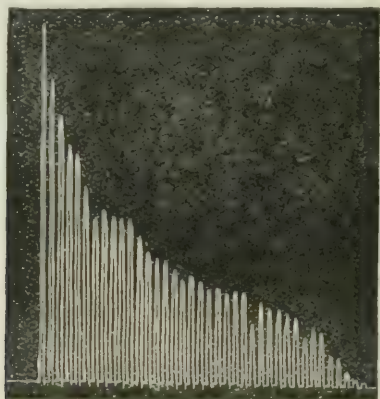


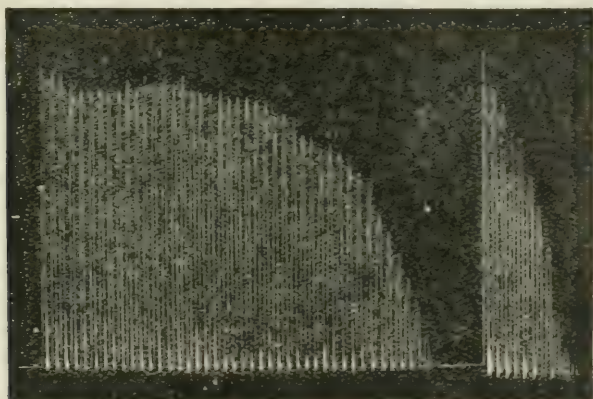
Fig. 7.

*After Mosso. Tracing from Dr. Maggiora, showing rapid but gradual failure from fatigue.*

complete. This experiment, however, is open to the fallacy that stimulation of the nerve does not act, I think, only upon the motor fibres which go to the muscle, but affects also the sensory fibres which produce more or less painful sensation. The curve of fatigue produced by the stimulation of the peripheral nerve is not unlike that obtained from voluntary muscular contractions. But these fatigue-curves vary very much in different persons, and even in the same persons at different times. Thus, in the tracing given by Professor Mosso from Dr. Maggiora, the curve gradually falls quickly from the very beginning of the experiment. In Professor Adducchio's it falls slowly at first (as in first part of Fig. 8), and very rapidly afterwards, whilst in Dr. Patrizi's it remains nearly



at the same level for a long time and then the muscle gives



A Fig. 8. B

*After Mosso. Voluntary contraction. A, Before conducting an examination.  
B, After examining nineteen candidates.*

out all at once (Fig. 9). The difference between these curves seems to depend upon the comparative development of the



Fig. 9.

*After Mosso. Tracing from Dr. Patrizi, showing long-continued movement and abrupt failure.*

central nervous system which in Fig. 9 sends stimuli of increasing intensity and keeps up the flagging muscle until complete exhaustion sets in. This power of the nervous system over muscle is a matter of common observation in horses, some of which quickly flag on exertion, while others run on until they die. The tracing obtained from Dr. Maggiora with increased

strength and better health (Fig. 13) approximated more nearly to that of Professor Adducchio's.

Fatigue of muscles and their failure to contract are not due, as one would at first suppose, to exhaustion or destruction of their contractile elements; but are really produced by the muscle being poisoned by the products of its own action, just as a fire becomes choked by its own ash. If a muscle is made to contract by electrical stimuli until it quite ceases to respond, and the products of its own waste are washed out of it by a current of saline solution being forced through the artery which supplies it, its contractile power is again

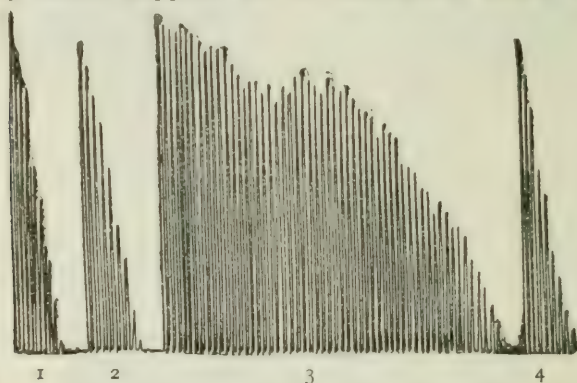


Fig. 10.—Effect of massage on fatigue.

After Maggiora and Vinaj. *Blät. f. Klin.*: "Hydrotherapie," 1892, p. 6. 1. The fatigue curve of the left hand raising a weight of 3 kilogrammes every two seconds. 2. The fatigue curve of the right hand. 3. The fatigue curve of the left hand after five minutes' massage. 4. That of the right hand without massage.

restored, and the same effect can be produced to a certain extent by massage being applied directly to the muscle, and the products of fatigue being squeezed out of it.

The same effect can be produced in the muscles of an uninjured limb by massage, and the fatigue consequent upon over-exertion can be to a greater extent removed by systematic massage (Fig. 10).

Provision has been made by nature for what may be called self-massage of the muscles, by which the products of waste are pumped out of the muscle by its own contractions. Each muscle is encased by a hard fibrous covering or fascia, between which and the muscular fibres lies a lymph space. Each time the muscle contracts it squeezes fluid from this space into the

lymphatics, and each time it relaxes, it tends to produce a vacuum within the fascia which is filled up by fresh arterial blood,

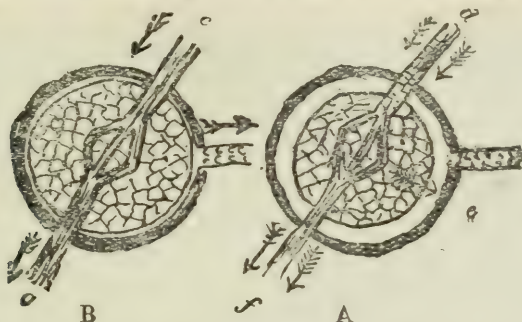


Fig. 11.

*Diagram of transverse section of voluntary muscle to show the pumping action exerted on the muscle juice and waste products during action. The blood-vessels cross diagonally. To the left (B) the muscle is contracted and presses the two layers of the fascia together so as to drive the muscle juice out into the lymphatics. To the right (A) the muscle is relaxed and tends to draw the layers of fascia apart and to suck the juice out of the muscle into the lymph space. c, Artery. d, Artery. e, Lymphatics. f, Vein. g, Vein. The double arrows in (A) are intended to indicate the increased blood flow through the muscle, and the single arrow within the muscle to indicate the passage of fluid from the muscle into the lymph space between it and the surrounding fascia.*

the venous blood and lymph which have been squeezed out being prevented from returning by the valves in the veins and lymphatics. The more the muscle acts the better is it supplied with blood, and the more thoroughly are its waste products removed. It is in consequence of this that, when an animal or man is stiff with standing, exercise restores the contractility of the muscle and the suppleness of the limbs. But this provision only succeeds up to a certain point, and, by-and-by, more waste products are produced than the pumping apparatus of the muscles themselves can remove. And it appears to be a fact that continued exertion does most harm to the muscle after it begins to get wearied. It is possible that this damage is of twofold origin, chemical and nervous. So long as the muscle works within its powers, it utilises carbohydrates as the source of its energy, and does not break down any of the proteids of which its contractile substance is composed. But, when the muscles are forced to work after they are wearied, they seem to use up their albuminous constituents. Thus it is that great exertions may be performed without any increase in the urea of the urine, provided that these exertions do not



over-fatigue the muscles, but when over-fatigue occurs the breaking up of albuminous tissue is shown by the large increase of urea in the urine.

A possible cause of nervous injury is this. Professor Sherrington has found that contraction of one muscle tends to cause reflex inhibition of its opponent. If this inhibition should become imperfect, the muscles will to a certain extent work against each other instead of the whole of their force being applied to external work. We can thus see how useful a provision of nature it is that the sensation of fatigue should be felt long before the muscle itself is exhausted, so as not only to prevent complete paralysis, but also to arrest the continuance of exercise beyond the point up to which the muscles can work without injury.

Mental fatigue is evidenced externally to some extent by muscular weakness, and mental fatigue, like bodily weariness, will cause the eyelids to droop and the muscles to relax. The effect of mental fatigue in lessening muscular power has been beautifully shown by Mosso in some experiments which he gives in his book *On Fatigue*. A tracing taken by the ergo-

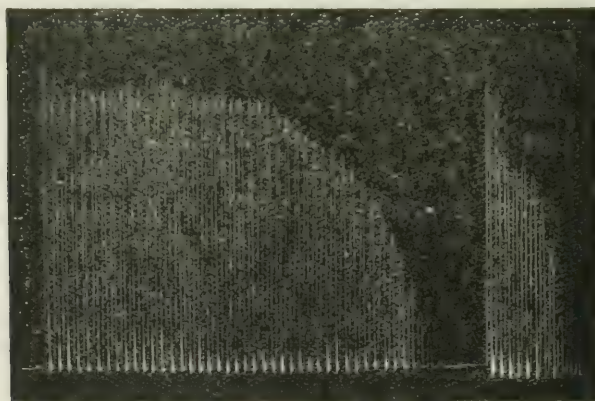


Fig. 12.—*Effect of mental work on muscle.*

*After Mosso. Voluntary contraction. A, Before conducting an examination. B, After examining nineteen candidates.*

graph, before conducting an examination, shows well-sustained and prolonged muscular energy, but when the second tracing is taken, after examining 19 candidates, the muscular power

falls very rapidly and is very quickly exhausted. A similar, but less marked, fall is shown in the mental fatigue of

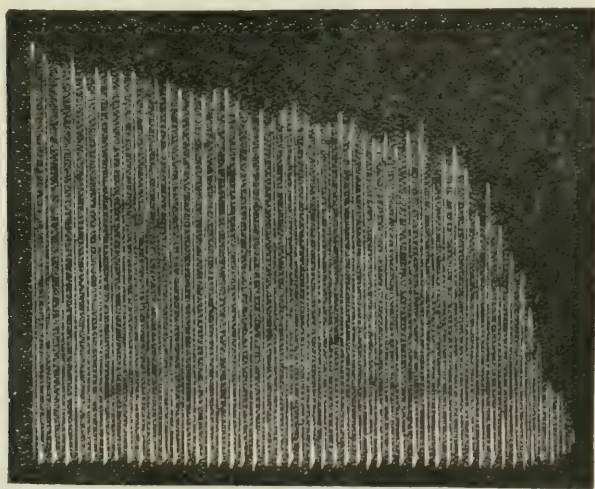


Fig. 13.

*After Mosso. Normal tracing from Dr. Maggiora.*

giving a lecture (Figs. 13 and 14). One might suppose that this was simply due to the mental exhaustion, but this is not

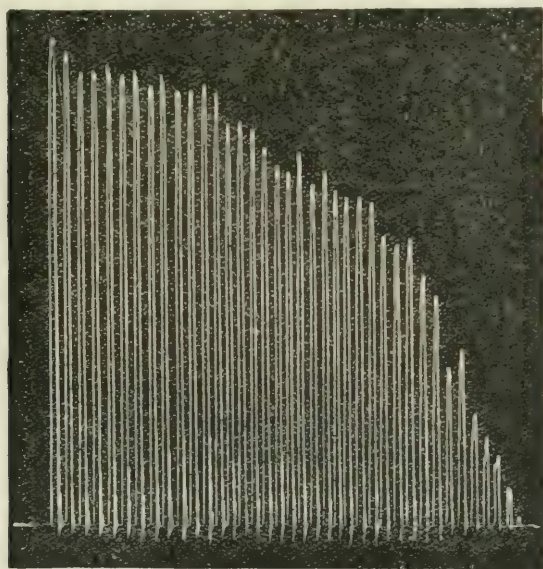


Fig. 14.

*After Mosso. Tracing from Dr. Maggiora, when fatigued by giving a lecture.*

the case, for similar tracings are obtained when the finger is made to contract by electrical stimulation of its flexor muscles—a fact which demonstrates that the mental fatigue has caused actual muscular weariness (Fig. 15). A similar relation is

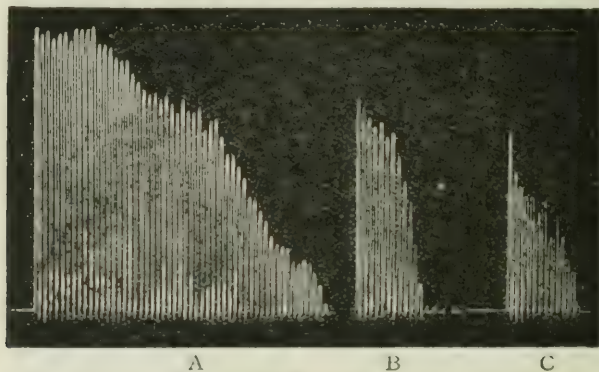


Fig. 15.

*After Mosso. Exhaustion curve from electrical stimulation. A, Before examination. B, Immediately after examination. C, Two hours after close of examination.*

observed in the brain to the products of muscular fatigue, for lactic acid, which is one of the products of muscular contraction, has been shown by Preyer to have a soporific action. From the experiments I mention it is clear that in regard to fatigue, the brain and the muscles go together, and that it is a mistake to regard muscular fatigue as a stimulus to the brain, or mental fatigue as a stimulus to the muscles. We must not look upon hard mental exercise as a relief from muscular exercise, nor upon hard muscular exercise as a rest for the brain. In saying this I wish to point out that I am speaking here of exhausting work, and that slighter efforts, either of the brain or muscles, when not continued too long, may have a very different effect. But to this point I must again return when considering the effect of exertion upon circulation.

A great deal of the mental work done in schools and offices involves much muscular action, although this may affect only a very small group of muscles, viz., those connected with the eye. The ciliary muscle is in almost constant use, adjusting the focal distance of the lens to the objects looked at, and the extrinsic muscles of the eye are in constant use as the eye travels to and fro over a page. The closeness of the connection between mental integrity and the visual apparatus



was brought before me very plainly several years ago. A gentleman came to me from South Africa complaining that he thought he had a tumour in his brain because his mental powers were leaving him. He had a large business, which he had been accustomed to manage with perfect ease, but now, he said, he looked at his books and could understand them perfectly for four or five minutes. Then, he said, the whole book seemed to get confused, and he could not add the figures together. On testing his eyes I found that, with advancing years, he was becoming presbyopic. When he first looked at his books, he was able, by a great exertion of the ciliary muscle, to focus the figures and see them distinctly, but, in four or five minutes, the ciliary muscle became fatigued, and the figures became blurred with the result that he thought his mind was giving way. I sent him to an oculist, who had him provided with proper glasses, and he went back to South Africa perfectly well.

The importance of the extrinsic muscles of the eye was impressed upon me by the case of a student at St. Bartholomew's Hospital. He was a steady, hard-working fellow, but could not pass his examination at the London University on account of the severe headaches which always came on shortly before the ordeal. He got glasses which corrected the astigmatism, but he was not improved. I sent him to one of my colleagues, who found that convergence was deficient, and, by providing him with prismatic spectacles, the headaches were abolished, and he passed his examinations with comfort. In ordinary circumstances, the deficiency in convergent power was so slight as not to make itself felt, but, under the strain of reading for an examination, the muscles became fatigued, and his power of steady work was destroyed for the time being.

Even when the eyes are unconscious of external objects, there may be a great deal of optic strain associated with thought, for, when the attention is fixed upon a mental problem, the eyes are frequently kept rigidly fixed upon some external object, staring at it, although the person does not in the least know at what he is looking.

But the eyes have further a most important effect upon the brain apart from the ciliary muscles. If the two eyes

are quite different in focal length, or if one of the eyes is entirely useless, the better eye does all the work and the other does not interfere. But if the two eyes are very nearly, but not quite, equal the brain seems to receive a blurred impression, similar to that which is given to the eye by looking at a piece of print which has shifted slightly in the press. The one mental image seems to interfere with the other, and a person in this condition may read a page of print several times over without in the least understanding its meaning, although when the difference between his eyes is equalised he understands it without effort. In saying this I speak from personal experience. When I was a boy of seven or eight years of age I received a blow from the pellet of a pop-gun on the right eye, which was damaged in consequence. For many years I practically used the left eye, and in reading print I took in the sense without being conscious either of the letters or the words. One day, however, in reading some proof I found that a change had occurred in me of the most disquieting nature. I no longer took in the sense, I laboured over the words one by one, and it was only after reading a short article three or four times over that I could make out the sense. The reason, as I afterwards found, was that the left eye was beginning to fail, so that the two eyes were nearly on a par. After a short time, the left eye became much weaker than the right, which then took up the running, and I again read with ease as before. During part of the time when the difference between the two eyes was slight, I had it corrected by glasses, but when the difference became very marked on account of the greater failure of the left eye, the glasses were no longer necessary, the right eye sufficing for the work.

Images starting from the brain itself may obscure those which are entering the sensorium through the eye, and every one knows how visions of a football or cricket match in the afternoon may obscure the Greek or Latin images conveyed by the eyes to the sensorium in the forenoon by the pages of class books. By means of a powerful effort these disturbing mental images may be banished, and attention concentrated on the work before one, but when fatigue, either of body or of mind, or ill health occurs, this becomes less and less possible. There seems to be a slight analogy between these mental images and the images which occur in the eye after gazing at an

object. These after-images remain much longer in debilitated than in strong persons. The power of recuperation in the eye and rapid adjustment for new images probably depend to a great extent on the rapidity with which the blood circulates through it. This is certainly so to a great extent with the brain, in which, as Mosso has shown, the circulation varies very quickly, and to a great extent with the functional activity of the organ. To such an extent is this the case that Mosso

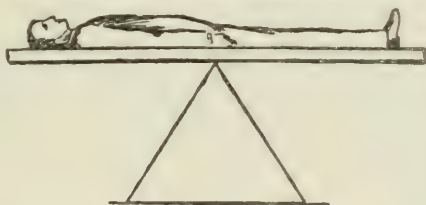


Fig. 16.

*Mosso's Table Balance for weighing thought.*

was able to "weigh thought," if we may use the expression. He constructed a large but very delicate balance on which a person lay. When the mind was quiet the balance was in equipoise, but whenever the person began to think the head went down on account of the greater quantity of blood going to it for increased thought. In a man who had lost a part of his skull he was also able to observe alterations in the brain, and he observed that thought caused the cerebral vessels to dilate. Vaso-motor nerves are said by some not to exist in the cerebral vessels, and it is therefore possible that this rapid change of calibre depends upon chemical changes in the brain itself, but whether the variations in the cerebral circulation occur through the medium of vaso-motor nerves or not is a matter of comparatively slight importance, for the variations do exist, and the amount of cerebral work is very closely dependent upon the vascular supply. This was shown by Mosso, who found that long-continued muscular exertion renders the brain anæmic, and impairs its functional activity to such an extent that quails, after a long flight, are unable to see objects in front of them, and are killed by dashing against them. A personal experience of my own, which I have already related somewhere else, gave me a curious light upon the relation between mental work and cerebral circulation. Many years ago I used to write for a medical periodical. On returning home one day, after a very



heavy day's work at the hospital, and feeling completely exhausted, I found a note from the editor, "Please let me have an article on such and such a subject to-night." I sat down with pen and paper before me, but not a word could I write. Then I lay back lazily, and began to speculate as to the cause of my want of ideas. I thought "the brain is the same as it was yesterday, but yesterday I was not tired, perhaps it is the feebler circulation that prevents the brain from acting. If the blood does not go up to the brain, I may bring the brain down to the blood." I therefore placed my head flat on the table, looking sideways at the paper, and began to write easily. On raising my head again every idea fled, so I placed my head again down on the table, and finished the article with my head in that position. A similar instance was afforded by the



Fig. 17.—*Mr. Lecky in various attitudes.* (With the kind permission of the proprietors of "Punch.")

practice of the late Mr. W. G. Lecky, the historian. He had, as every reader of *Punch* knows, a large magnificent head, mounted upon a long neck and a willowy body. He found out that his circulation was not sufficiently strong to raise the blood to his brain in sufficient quantity for its functional activity in the upright position. A mutual friend informed me that he wrote his *History* lying upon the sofa. I was so much interested in the question that I asked Mr. Lecky himself. He told me that this was a mistake, that he did not lie down, but actually wrote kneeling on a sofa which had a large broad head to it. This served him for a writing table, and, in this kneeling

position, he wrote all his works, the blood having thus to travel to his brain in a horizontal line, instead of upwards against the

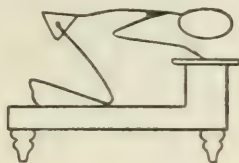


Fig. 18.—*Diagram of the position assumed by Mr. Lecky when at work.*

force of gravity as it would have had to do in the sitting position.<sup>1</sup> Involuntarily people adapt their position to the



Fig. 19.—*Attention.*



Fig. 20.—*Interest.*

intensity of their brain functions, so that a man engaged in argument, is apt to bring his head forward and downwards into a position in which the blood can be driven more freely into the cerebral vessels by the heart.



Fig. 21.—*Eagerness.*



Fig. 22.—*Excitement.*

The necessity of the circulation through the spinal cord for

<sup>1</sup>Mr. Lecky gave me permission to publish this fact.

its functional activity is shown by the well-known experiment of Stenson, who showed that, if the aorta of a rabbit is com-



Fig. 23.—*Reflection.*

pressed for a few minutes by the finger, the whole of the lower limbs and the lower half of the body become completely paralysed, and it is only a certain time after the re-establishment of the circulation that motor power is regained. There is, therefore, a very close connection indeed between muscular work, mental work, and the activity of the heart and muscles. To this we may add also the respiration. If one hurries up a stair, one is very likely to arrive at the top out of breath, and with the heart beating very much more quickly than usual. One might be inclined to attribute these phenomena to the blood having been pumped very quickly through the body by muscular action and to stimulation of the nerve centres in this way. But this is not the case, for the quickened pulse and rapid respiration are produced by the action of the products of muscular waste on the nerve centres. This was demonstrated by Mosso at the International Congress of Medicine in Berlin, in 1890. If a dog is narcotised with opium, and the blood of another dog that has been kept quiet is injected into its veins, no alteration occurs in the respiration or circulation. But if the nervous system of another dog is stimulated by an electrical current, and tetanus is produced even for two minutes, its blood, when injected into the sleeping dog, will accelerate its respiration, and make its heart beat rapidly. This is not due to carbonic acid but to actual toxins, because when the blood is stirred up with air, so as to thoroughly arterialise it, it still retains its effect upon the circulation and respiration.

Toxins, which can produce fatigue, can be separated from exhausted muscles by expression of their juice. Not only is this the case, but by treating albuminous substances derived



both from vegetables and animals with reducing and oxidising agents, and by reduction of tubercle bacilli, Weichardt obtained the same toxins as from exhausted muscles. When these are injected into animals they cause the muscles to become soon exhausted upon exertion. He was, however, also able to produce an antitoxin, which had the effect not only of counteracting the fatigue toxin, but of gradually pro-

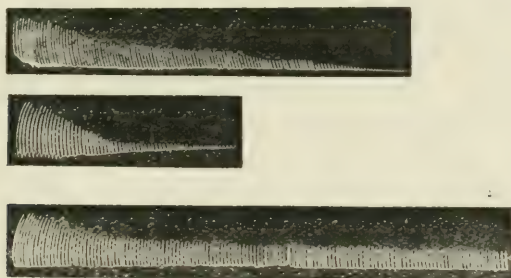


Fig. 24.

*After Weichardt. Effect of fatigue toxins and antitoxins. The upper tracing is that of normal muscle. The middle is that of a muscle poisoned by fatigue toxins. The lower is that of a muscle whose endurance is augmented by fatigue-antitoxins.*

longing the endurance of the muscle.<sup>1</sup> There is a curious resemblance between the effect of toxins produced by fatigue and the venom of the cobra, which was shown by Sir Joseph Fayrer and myself<sup>2</sup> to have a paralysing effect upon the spinal cord, the motor nerves, and the muscle itself, and they also resemble cobra venom in the fact that Weichardt obtained his fatigue antitoxins in the same manner as Fraser and Calmette obtained anti-venins. Fraser found that by injecting a small dose of snake venom into a horse, using at each time only enough to produce slight symptoms, he was able to increase the amount until fifty times the fatal dose could be injected without doing any harm.

The serum of a horse, thus treated, when injected into an animal poisoned by snake venom, prevents death unless the dose of the venom is too great. I have myself seen two rabbits poisoned by similar doses of cobra venom. Into one

<sup>1</sup> W. Weichardt: *Münchener Med. Woch.*, 1906, p. 7.

<sup>2</sup> Brunton and Fayrer: *Royal Society's Proceedings*, No. 149, 1874, pages 92 and 93.

Professor Calmette injected the anti-venin serum, while the other received no treatment, and, in about half an hour, the one which had received the serum was alive and well, while the other was dead. The symptoms produced by Weichardt's toxins are very nearly the same as those of snake venom, and his antitoxin neutralises the toxin, either when mixed with the toxin before or when injected simultaneously with it.

A curious point in regard to fatigue, and possibly associated with the formation of antitoxins in the body, is, that after a walk of four or five miles intense weariness sometimes comes on, but if the person continues to walk in spite of it the weariness gradually passes off and may not return, although the person continues to walk the greater part of the day. Many years ago I noticed in my own case that after a walk of four or five miles I felt more fatigue than if I had walked twenty.

The effect of food in the stomach as preventing, or relieving, fatigue is very extraordinary. Many years ago I took a walking tour with my friend, Dr. Mitchell Bruce, in the Austrian Tyrol, and we made the discovery that we could entirely prevent fatigue by taking food every two hours. We thought this was entirely new, and intended to publish it on our return home, but one day, while taking lunch on a moraine in the middle of a glacier, we turned up the pages of Baedeker, and found, amongst others, a recommendation to this effect. Alpine guides are thoroughly aware of it, and usually make climbers eat every two hours, whether they wish it or not. The effect of food thus taken in removing fatigue is so rapid that it seems hardly possible for absorption to have occurred, and for the food to be carried to the muscles. It is, I think, not improbable that the action is an indirect one. The work of the muscles appears to be carried on, like that of the glands, to a great extent by means of enzymes or ferments, and many years ago I separated from muscle a glycolytic ferment. I obtained it, however, in a small quantity, and my experiments on muscles are very like those of Corvisart upon the pancreas. Corvisart succeeded in obtaining a proteolytic ferment from one pancreas, but he experimented on hundreds of others before he could obtain it again. The reason was that the proteolytic ferment is only contained in an active form in the pancreas

during digestion. During fasting, it is present in the form of an inactive zymogen. Starling has found that the zymogen is converted into an active enzyme by a secretion formed in the intestinal wall, and it has been found also that an enzyme in muscle is rendered active by a similar secretin-like body formed by the pancreas. But Pawlow has shown that saliva, or even water in the stomach stimulates secretion of the pancreas through its nerves, and thus one can readily understand how food taken into the stomach can not only act, but act very rapidly, upon the muscles, the chain of action being—(1) food in stomach stimulates the pancreas, (2) this produces a stimulating body, which (3) is absorbed by the blood, (4) passes to the muscles, (5) renders their enzyme active, and so (6) increases their power.

The exact chemical nature of fatigue-toxins has not yet been determined, but I think it is quite likely that they may be nearly allied to ammonia or to compound ammonias. When the isolated muscle of a frog is fatigued by over-exertion, irritation applied to its motor nerve ceases to cause contraction before the muscular fibre itself has become completely exhausted, and while direct irritation of the muscular fibre by electricity will still cause it to contract. Although the sensation of fatigue is first felt in the nerve centres, it next affects the peripheral ends of nerves, and lastly the muscles. In a research (Fig. 25) I made many years ago upon the action of ammonia on muscle and nerve, by aid of a grant

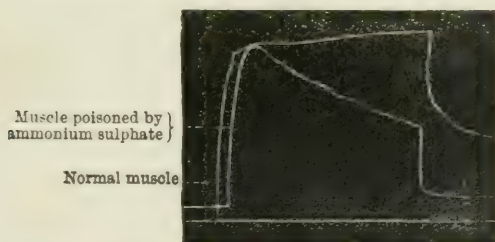


Fig. 25.—*Tetanus-tracing to show the paralyzing-action of ammonium sulphate on muscle. At first the contractions are nearly equal, but that of poisoned muscle quickly falls, whilst that of the unpoisoned one slightly rises.*

from the Royal Society, I found, amongst other things, that salts of ammonium have exactly this action on muscle and



nerve, viz., that they greatly lessen the contractility of the muscle, but that they destroy its power of responding to

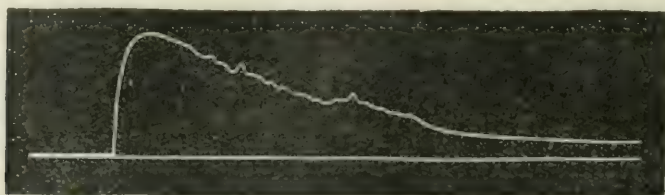


Fig. 26.—Tetanus-tracing to show the paralyzing action of amylamine on muscle.

electrical stimulus supplied to its motor nerve before the muscle itself is exhausted. They sometimes do this in a very peculiar way. The first stimulus applied to the nerve causes the muscle to contract just as much as an unpoisoned muscle, but the second stimulus applied to the nerve has sometimes no effect. It seemed as if the first stimulus had destroyed the end-plate of the motor nerve in the poisoned muscle, and that this prevented any further action of the nerve just as too powerful a current may break down a fuse, and thus completely terminate the connection between an electric lamp and the source of electricity which should cause it to glow. My experiments were not published *in extenso*, only a short abstract having appeared in 1881, and the facts that I have just mentioned were not recorded in it, but in my text-book on Pharmacology.<sup>1</sup> They are, I think, interesting, not only in relation to fatigue but to the pathology of the somewhat rare disease, myasthenia gravis, in which the ends of the motor nerves of the muscles seem to be affected somewhat in the same way as after poisoning by ammoniacal salts (Fig. 26).

In healthy people, the ingestion of food is usually followed by increased power of work, but in some people a sensation of overpowering fatigue comes on some little time after a meal. This is often very marked about one and a half hours after breakfast, and it sometimes leads patients to have recourse to stimulants in order to get them through the day's work. This weariness is evidently of a toxic nature, and is

<sup>1</sup> *Text-book of Pharmacology*, 1886, p. 567.

probably due to faulty metabolism in the intestine or liver.

In a paper in *THE PRACTITIONER*, 1880, on Indigestion and Nervous Depression, I considered this weariness to be probably due to the absorption of unchanged albumoses, in which case the seat of faulty metabolism would probably be the intestinal wall where they ought to be built up into albumens; but if they are of the nature of ammoniacal salts, or compound ammonias, the seat of deficient metabolism would be the liver, which has the power of converting certain ammoniacal salts into urea. But the power of the liver to destroy toxins is not entirely confined to ammoniacal salts, for Bokenham and I found that the liver had the power of destroying the toxic properties of diphtheria toxin which was circulated with the blood through the vessels of an isolated liver. We can, therefore, see how faulty metabolism in the digestive organs may be responsible for a great deal of fatigue. In addition to this, toxins may be directly formed by certain pathogenic micro-organisms.

The bacillus coli seems to have a special power of producing fatigue toxins, and many people in whose intestines it exists in great abundance suffer from constant weariness. When they go to bed at night they are tired, when they rise in the morning they are tired, and their complaint often is the one that I mentioned at the beginning of this article that they are "always tired."

Another form of weariness is that of emotional fatigue. Depressing emotions, such as worry or sorrow, may produce both an expression of weariness and a sensation of weariness. I have observed in my own case that sometimes the

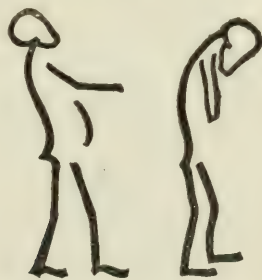


Fig. 27.—*The Pharisee and the Publican. Mental exhilaration and mental depression.*

expression of weariness was observed by others before I perceived any sensation of it myself. Some years ago, I used



Fig. 28. —*Grief.*

frequently to wonder why people said to me "How tired you are looking," when I was unconscious of any feeling of fatigue, but experience showed me that, when this remark was made, I was feeling sad or worried, and that often a feeling of exhaustion or fatigue came on from these emotions, so much so that by-and-by, when I felt tired without apparent reason, I began to think over what had happened to worry or sadden me, and I generally made out some depressing cause. Curiously enough, the effect of sadness or worry may be sub-conscious, and the persons who are its subjects may hardly perceive any emotion, and only become conscious of the sensation of weariness (Figs. 27 and 28).

I do not know that it is right to assume that in nervous Americans worry produces fatigue more readily than in others, but it would almost seem so, if we may judge from the fact that they very commonly say "you make me tired," instead of saying "you trouble me" or "you worry me." One of the curious things about emotional fatigue is the rapidity with which it comes on, and this may possibly be explained by the fact that Weichardt found that the gray substance of the brain yielded a fatigue toxin of great power.

While weariness may be produced by the direct action of chemical substances on the brain itself, on the motor nerves, and upon the muscles directly, we must always remember that a part is played by the circulation, both in supplying the substances necessary for functional activity, and in removing fatigue-producing bodies. I have already mentioned the effect



of posture in regard to mental activity, and in some feeble persons bodily quiet is necessary for the purpose of mental processes. Mark Twain's horse, which was so feeble that it seemed as if it wished to lean up against a post to think, is not alone in its peculiarities, for they are shared by some human beings. The common observation that it is difficult to do any hard mental work immediately after a full meal, and that if mental work is persisted on indigestion is apt to come on, was explained nearly two centuries ago by Mayo, who supposed that all the functions of the body were carried on by a number of sprites to which the name of "vital spirits" was given. When these spirits are up in the brain, he said, they cannot be down in the stomach, and, if they are down in the stomach, they cannot be up in the brain, and so digestion and mental work cannot be carried on at the same time. If we replace the term "vital spirits" by "blood" we get an explanation of the process very nearly correct in terms of modern physiology. In the same way I have already mentioned that violent exercise renders the brain anæmic and incapable of work, and yet we know that a certain amount of exercise not only keeps

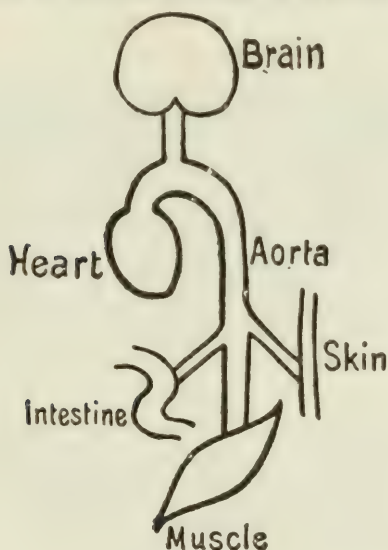


Fig. 29.

*Diagram showing the four great areas for the distribution of blood in the body, viz., the muscles, the brain, the intestine, and the skin.*

the body, the muscles, and the digestive organs in good condition, but also helps the brain to do more work (Fig. 29). The reason of this is, I think, twofold. First, that the blood supplied to the brain is of a better quality, and secondly that it is in larger quantity. When children have been out at play, they may for a few minutes after their return to the schoolroom be less able to think, and find application to their lessons more difficult than before they went out, but the play has not necessarily done them any harm. After the momentary effects of the muscular exercise have passed off, stimulation of the heart still remains, and the accelerated circulation soon becomes diverted from the muscle to the brain itself, and thus better work will be done than if the children had had no opportunity for play. But care must be taken that the play does not lead to exhaustion, with more or less permanent anæmia of the brain on the one hand, or strain of the heart on the other. It has been shown by Schott that severe strain will produce temporary dilatation even in a healthy heart, and clinical experience has shown that if this strain is frequently repeated, especially if the heart is enfeebled in any way, the dilatation becomes more or less permanent.

From my own experience I should be inclined to say that cardiac dilatation is especially liable to occur in children who are growing quickly, and in whom the muscular system of the limbs has grown out of proportion to the strength of the heart. The exercise which would be just sufficient to produce enjoyment and health in one child may in another give rise to weariness and exhaustion, and even to permanent damage. This is one of the reasons why systematic physical exercise in schools could not be introduced with safety until medical inspection had been made compulsory, for, without medical examination the exercise, while doing good to a number, might be most prejudicial to a few. This was brought very forcibly to my notice a short time ago by a doctor who brought his daughter to me for examination. She was a tall, healthy girl, apparently very strong, and well developed. He told me that only a short while before she had been appointed games mistress at a school to teach gymnastics and athletics, and he was horrified to discover that shortly afterwards she developed a well-marked mitral murmur, and, unfortunately,

I was able to confirm his observations when I examined her heart. The risk of over-strain and the ill-effects of over-fatigue, both in regard to the muscles of the limbs and of the heart, become greatly lessened by training, and Mosso has found that after training the amount of work done by the ergograph may be doubled before exhaustion sets in, as is shown by the

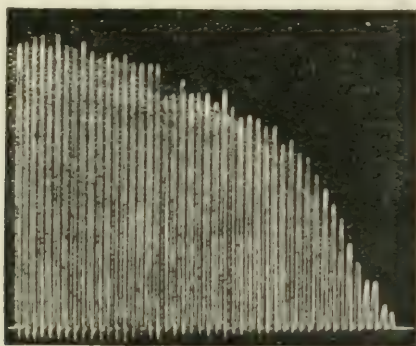


Fig. 30.

*After Mosso. Exhaustion curve of finger in healthy man from voluntary movement.*

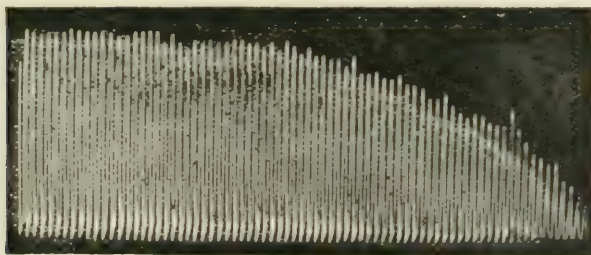


Fig. 31.

*After Mosso. Showing the effect of training in increasing endurance as compared with Fig. 30, from the same person. Owing to a difference in the apparatus the height of the curves is not comparable. The amount of work done was really double that in Fig. 30.*

accompanying tracings (Figs. 30 and 31), and the experience of training for all athletic contests shows that not only do the muscles become stronger and less easily fatigued, but that the heart acquires additional strength, so that the exertion, which



would at first have produced excessive dyspnœa, or even collapse, may at the end of a course of training be undertaken, not only without discomfort, but with actual pleasure. In the present state of our knowledge, we cannot precisely say in what training consists, but, in view of Weichardt's experiments, it seems not unlikely that the body becomes accustomed, not only to produce fewer fatigue-toxins during exertion, but also to form fatigue-antitoxins; and this seems all the more likely because the process of training must be carried on in exactly the same way as that of producing anti-venins, *i.e.*, the increase in the dose, either of the exercise or of venom, must be very gradual indeed. The best example of training, that I know of, is that of the famous wrestler Milo of Crotona, who was enabled to carry a full-grown bull on his shoulder by beginning to carry it when it was a new-born calf. Day by day he carried it, and day by day as its weight increased, his strength increased in proportion, so that at last the task, which in other circumstances would have been impossible, was accomplished with ease. Where fatigue is due to depressing emotions, we cannot hope to remove it entirely in the same way; but it is quite possible that, by training the muscular system, antitoxins may be formed which will render the person more able to bear worry or sorrow, even although the conditions which produce these emotions may be incapable of removal. Where weariness and inability to work depend upon a feeble heart, the heart may be strengthened by graduated exercise, by strophanthus or digitalis, or strychnine and caffeine, and by the use of iron, if anæmia is present at the same time. It is not to be forgotten that calcium is a powerful cardiac tonic, and that a certain amount of it, combined with other things, may greatly help their action. In considering the use of games, and especially in comparing them with systematic gymnastic exercises, it must always be carefully borne in mind that pleasure is a powerful stimulus both to the nervous system and the circulation, and therefore such games or exercises as give pleasure should always have the preference. Amongst all games those of ball have been favourites from the earliest times, and they not only give pleasure and exercise the muscles, but they tend to increase the power of co-ordination, which is of much more value than simple muscular power (Fig. 32). In the chronic

weariness which is due to intestinal toxins we also frequently give the remedies which I have just mentioned as cardiac tonics,



Fig. 32.—*Egyptian Ladies playing at ball. From a painting in a tomb about 3,500 years old. The first three figures have balls in each hand, and the third appears to be throwing them backwards for the fourth and fifth to catch. The tenth lady is throwing balls for the seventh to catch, both of them being mounted on others. (Cailliaud. Recherches sur les Arts et Métiers.)*

and these may act upon the intestines themselves directly, or may act indirectly on them through the improved circulation. We may give artificial aids to digestion, such as pepsin and pancreatin, and Metchnikoff's treatment by administering the bacillus lactici acidi, or milk acidified by it, sometimes succeed in curing some cases of weakness and depression which have resisted ordinary treatment. In many cases of chronic intestinal catarrh we find alternate constipation and diarrhœa, and in such cases we ought to give intestinal antiseptics as well as cardiac tonics. A very interesting problem may yet turn out to be the relationship between intestinal toxæmia and the statement which has been put into the mouth of the unemployable British workman, "I eats well, I drinks well, I sleeps well, but when I sees a job of work coming along, I'm all of a tremble."



## INDIGESTION.

By F. J. SMITH, M.D., F.R.C.P.,

*Physician to the London Hospital, etc.*

INDIGESTION is, perhaps, the commonest malady or which patients complain, and, being so common, it has suffered the inevitable fate of being subjected to the modern craze for analysis and division and sub-division into the minutest of varieties—on this I shall have a little more to say later. For the present purpose it is sufficient to say that it is the means by which a stomach gives its possessor due notice that the food which he has put into it is not suitable for the occasion. These means consist of one, or generally a combination of several, of the following, which we term symptoms, and which are the complaints made by patients, viz., wind, fulness and discomfort after meals amounting, perhaps, to severe pain, nausea, pyrosis, or water-brash, vomiting, may be headache, and, perhaps as important as any, constipation or diarrhœa.

It is obvious that any or all of these symptoms may be due either to some gross organic disease (not necessarily of the stomach at all), or to that simple functional disturbance to which alone the term dyspepsia should be confined.

Test meals with exact chemical analysis of their remains, pictures on an X-ray screen, gastroscopes, gyromeles, and all other exact methods of examining the stomach, are useful to the very last degree in certain obscure cases for determining in which category (organic or functional) a case shall be placed, and we use some of these for our in-patients in hospital wards to which only the really doubtful cases come, but they none of them seriously enter into consideration in the daily routine of general practice, in which the great majority of patients are up and about, performing their accustomed duties.

A more practical way of dealing with the subject of dyspepsia is to divide our patients into three classes—babies, children, and adults, and then to take a general survey of affairs in these three classes.



It is in babies that I really believe the most genuine cases of indigestion occur, *i.e.*, a simple want of sympathy between the stomach and its contents. These immature organisms are supposed to be incapable of digesting anything but milk, and undoubtedly the mother's milk is in almost every case the most suitable, but often (alas! how much too often) this is not available, and then trouble begins, or at least is apt to do so, though I have known many hundreds of babies who have flourished on other things than milk, at least in addition to their milk.

To enter at all fully into the artificial feeding of infants would require too much space, but I cannot leave the subject without referring to two points.

First, I am quite sure that much harm, far more than is dreamt of by the scientific sanitarian, is done to babies by the boiling, or the so-called sterilisation, of milk, either of which processes has an effect upon the milk and renders it less suitable for the due nutrition of the infant. I have seen several cases of bad scurvy-rickets arise from this cause. The remedy lies much farther back than the domestic supply, *viz.*, in seeing that the milk-yielding cows are healthy, and that the sanitary arrangements and cleanliness of the milking sheds and dairies are as nearly perfect as possible.

Secondly, I wish to protest against the view that babies cannot digest a small proportion of carbohydrate material, and the absurd fuss made by scientific baby-feeders against such an addition. These very gentlemen themselves have to recommend the addition of barley-water to cow's milk, and this contains much more, and worse prepared, starch than do some of the best proprietary foods.

Now, as to children. Having left its pure milk dietary behind it, the child proceeds to become the subject of experiment guided by universal experience, and is given portions of ordinary food stuffs, and learns by this what it can digest and what it cannot. Now and again exceptional cases crop up in which it gradually becomes evident that there are certain articles of diet which a given individual child cannot digest, but such cases are infinitely rare, and can only be treated by avoidance of the article in question, for a time at any rate, and by hoping for a tolerance in the future—a tolerance

which arrives sooner or later in nearly all cases. As for the rest of the indigestion occurring in children up to the age of 15 or 16 years I am quite sure that it arises from the absurd luxury with which children are now fed, not only at home (late dinners, made dishes, cakes at all hours, etc.), but even at school under modern ideas of the requisites for a growing child. The treatment of such cases is, however, fairly obvious—early to bed, early to rise, and plain once-cooked food. There is one important symptom in children's dyspepsia which needs a little further consideration and that is constipation. The fewer drugs that are given for this the better, but a little syrup or confection of senna may be tried, or even a few senna leaves stewed with fruit. The most important items are diet and exercise; the former should comprise plenty of fruit, treacle, and suet puddings and articles of that kind, and vegetables, and for exercise I know nothing better than a skipping-rope for girls, or for both sexes, and rowing for boys, that is, exercises which call the abdominal muscles into play, thus providing natural massage for the intestines.

As childhood passes we come nearer and nearer to the time when the indigestion of adult life begins, and our chief anxiety is to be sure that there are no organic changes to account for it, *e.g.*, gastric or duodenal ulcer: so we now pass on to the third group of patients, *viz.*, adults.

It is on these unfortunates that the would-be scientist has exercised his ingenuity in devising varieties and sub-varieties of description, after much painstaking effort at arriving at a discovery, of the *end products or results* of indigestion. It would be much better to devote attention to *causes*, and indeed the specialists would, I suppose, defend themselves by saying that they do investigate causes, and I may yield the position so far as to say that their investigations are of inestimable value in deciding whether the cause is organic or not, but even here it is seldom that the elaborate devices that I have just mentioned are really requisite. With each new invention of an instrument for exact investigation we lose a proportion of that clinical instinct and delicacy of finger-touch which were so highly prized by our predecessors, and which enabled them to be astonishingly

accurate in diagnosis ; we lose too that personal interest in and keen observation of the patient which are so invaluable ; our minds become concentrated on the disease, and we forget the patient with all his own natural resistance to, and with most extraordinary and unknown powers of overcoming, disease, if encouraged to use those powers and is not overwhelmed with drugs and courses of treatment.

I would ask the profession, in the name of common sense, having once found out to the best of our knowledge and belief, that there is no organic cause for indigestion—Does it help in any way to clearer conceptions of indigestion to prefix it with so many names—atonic, hyperchlorhydria, hypochlorhydria, apeptic, gouty, rheumatic, atrophic, dystrophic, renal, irritative, flatulent ? Surely it is better to consider what sin a patient has been guilty of that he should be thus troubled, and how he can be helped back to paths of physiological righteousness. The stomach is a long suffering organ, as indeed it was meant and has need to be, but even a worm will turn at last, and so the stomach resents the treatment it is being subjected to, and cries out for more consideration.

This article is mainly intended for those who have not immediate access to a laboratory for exact analysis. I propose, therefore, very briefly to run over the symptoms of indigestion, and to point out those features which suggest organic disease and render scientific investigation desirable. We may take them in the order in which I wrote them down, for there is no very logical order in which to arrange them.

*Wind or Flatulence after Meals.*—This is an important symptom owing to the fact that it so frequently rouses in the patient an idea that his heart is wrong. In itself it may be said to belong rather to the simple cases than to the organic ones, especially if unaccompanied by pain, but it must not be forgotten that it may be due to a fermentation, which in turn is caused by undue retention of food from pyloric stenosis. If the eructations have an unpleasant odour of their own, not that of the flavour of some food, it renders pyloric stenosis the more probable. The later its occurrence after food the less likely is the case to be one of simple indigestion : a mere sense of fulness *directly* after a meal is almost certainly due to functional trouble ; if it occurs later and is then associated with



some pain it points strongly in the direction of gastric or duodenal ulcer.

*Pain.*—I think it must be admitted that simple indigestion may be painful, but without pain its presence is distinctly a quieting factor. Varieties of pain can be distinguished: it may be felt in the epigastrium, or just below the ribs, *i.e.*, actually in the stomach, and then it is very suspicious, especially if it is very severe and rapidly relieved by vomiting. Such pain is also likely to be fixed in one spot and to be constant in intensity. On the other hand, it may be felt generally in the abdomen, it may be shifting in position and variable in intensity; such pain as this commonly points to simple indigestion, and represents the protest of the intestines against the work of the stomach, which has been badly done. Lastly, is the pain relieved or aggravated by pressure, and is it accompanied by tenderness which is made worse by deeper pressure? The pain of organic disease is almost invariably made worse by pressure and accompanied by a tenderness to manipulation aggravated by deeper pressure.

*Pyrosis or Water-brash.*—A gulping-up of mouthfuls of fluid which burns, is almost always pathognomonic of simple trouble; it is very rarely indeed seen in organic disease.

*Nausea and Vomiting.*—Nausea, or a mere feeling of sickness is strongly suggestive of functional disturbance, though possibly that may be rather acute, as when a gross insult has been perpetrated on the stomach. Actual vomiting presents several critical points; thus if due to organic disease it almost always presents one of the following features:—(a) It may be enormous in quantity at one act; this strongly suggests, or almost proves, dilation of the stomach, and this is almost certainly due to organic stenosis of the pylorus, though now and again it is due to simple atony, but, whichever it be due to, the treatment is the same. (b) It may be periodical; this may, of course, be due to a periodical abuse of the stomach, but then the cause is obvious; but commonly a periodical vomiting without obvious cause is again due to gross organic mischief. (c) It may be frothy and foul; this proves conclusively that the food has remained in the stomach sufficiently long to undergo fermentation and the cause of this retention is usually organic, and requires serious treatment. (d) It may occur directly, or within a short time, after a meal,

and may consist simply of undigested food ; such vomit is suggestive either of simple indigestion or of an ulcer. (*e*) Lastly, one must note that if vomiting is anything more than casual it certainly indicates the absolute necessity for bed treatment, and no elaborate analysis is required to discriminate between serious cases and those of mild import.

*Headache.*—Headache requires but few words ; it certainly is an accompaniment of indigestion and constipation, but owns so many other causes that it requires no further mention here, except to emphasise the point that it is never the chief complaint in pure stomach trouble, whether functional or organic.

*Diarrhœa and Constipation.*—These require but little discussion, their relationship to indigestion or gross disease of the alimentary system is too obvious ; at the same time I have one little caution to give : Do not rely upon a patient's statements about either one or the other ; ask for precise details as to the number of times he visits the closet, and the character of what is passed. It may be taken as a paradoxical axiom that when a patient over 40 years of age complains, without apparent cause, of diarrhœa, he is probably suffering from serious rectal obstruction or from constipation ; on the other hand, I have had a patient complain thus of diarrhœa, but on personal inspection of his stools I found them to consist of large well-formed (but frequent) motions owing to the fact that he was a gross feeder.

#### THE TREATMENT OF INDIGESTION.

It is a mere truism to say that rational therapeutics should be based on the avoidance of causes, and yet in this, the commonest of all diseases or complaints, one hears less about causation than in any department of medicine.

Obviously, the first great point is to discriminate between the organic and the simple, and it must not be supposed that the few hints above detailed cover all the ground when the case is doubtful. All means must be resorted to, including test meals and exact analysis, and it is precisely here where science is so useful. Once a case has been decided, after exhaustive investigation chemically and scientifically, to be simple, then let common-sense and bedside medicine and

confidence between patient and doctor have full play, and let us banish fads like vegetarianism, lactobacilline, horse-serum, etc., except for those who persist in being ill because they enjoy it and because of the sympathy it arouses in their friends.

What then are the causes of indigestion or of simple gastritis (for the majority are cases of this latter trouble, started perhaps by a known injudicious act, and kept up by lack of a determination to undergo proper treatment)? No doubt they are many and varied, but they can be reduced to a few comparatively simple classes. First and foremost comes the hurry and bustle of modern life alike for male and female; this often involves a rush to the station in the morning with a hurried breakfast half masticated and with no chance of emptying the bowels; then follows an equally hurried luncheon, or perhaps, *per contra*, with some (especially our elderly patients) a heavy lunch with a liberal allowance of alcohol; then comes the rush back home after a heavy day's work, and a good square meal is taken with more alcohol. The picture is incomplete, but it must appeal by its truth to every one of us. I am not a fanatical teetotaler, but I am sure that another great cause is alcohol on an empty stomach. Let a man take what liquor he finds suits him with food, but let him avoid even one "whiskey" on an empty stomach. Almost the same argument, though in a less degree, applies to smoking, and I am sure that it has a great tendency to cause indigestion when indulged in before a meal.

Then, there is worry, which is even worse than work for engendering chronic indigestion, and is perhaps even more potent with women than with men. Domestic worries may be ridiculed by men, but they are very real all the same, and when they are added to hard work and irregular meals, they act very potently in producing that nervous exhaustion which almost inevitably ends in chronic indigestion.

*Diet.*—It is a very old saying that by the time a man is forty, he is either a fool or a physician, but so far as diet is concerned it is certainly as true as ever, and I am sure that in attempting to diet adults, or in advising them on a diet for indigestion, we must first in our turn learn from our patients what it is that observation and experience of their



own stomachs have taught them. It is not of the slightest use to evolve from scientific data a diet that ought to suit a given patient, if we find on experience that it does not suit him. We may, and should, carefully inquire into the precise items and exact times of his meals, and if we find anything—which, by the way, we rarely do—that is obviously unsuitable in the viands, we may advise that it is probably upsetting the stomach; but I am sure we do more harm than good by insisting on a fad in the way of diet which goes contrary to the average habit. Regular hours, careful and thorough mastication, and plain cooked food may certainly with advantage be insisted on for everybody, but it is useless to knock off this and that particular article because we think it ought not to agree. I have seen many patients thoroughly starved by multiple advice from many dieticians.

At the same time we must not accept at once, and blindly, a statement by a patient that he cannot digest an article of ordinary plain diet; put a few searching inquiries as to when he has eaten the article, and the circumstances as to exhaustion under which it was eaten, how often has it definitely caused unpleasantness, has it been properly chewed, did its consumption imply indiscretions, *e.g.*, turtle soup and a Lord Mayor's banquet?

There are only a few fads that I personally go in for in diet, one of them is to assure all my patients (not Jews) that *cold boiled* ham or bacon is of all flesh foods the most easily digested; other fads are that chicken is less digestible than beef and mutton when the latter are properly masticated; that there is no difference between red and white meat in digestibility, inherent in the meat itself that is to say, though a patient may prefer one to the other; that fish need not necessarily be boiled, but may be cooked to the taste of the eater; and, lastly, that if a patient likes to try any fad of the faddists it will probably do him no harm to do so.

One cannot leave the subject of diet without a word on the cooking of food. Amongst the working classes and perhaps amongst the middle classes many cases of indigestion owe their origin to bad cooking. Good cooking renders food not only more appetising but also more easily digestible, and the manner in which food is cooked is well worth inquiry

when investigating the cause of indigestion.

*Drugs.*—A very short list is sufficient of the drugs that are useful for dyspeptics. Iron, bismuth, saline purgatives, alkalies, and acids, and a few aromatic flavours, constitute nearly the whole. Opium, perhaps, should be included, for I have often obtained very excellent results from the use of very small doses, never exceeding 2 minims, and given before meals; it is in some cases almost necessary for the pain, but one should not let the patient know that he is taking it.

In deciding what drugs to give, it is useful to divide our patients into the full-blooded and the anæmic, into the sthenic and asthenic if you like, for as the result of very long experience in our out-patient department I learnt that for the indigestion of anæmic girls it was not of the slightest use to give drugs for the indigestion until one had helped or cured the anæmia by iron; this is quite contrary to the usual teaching, but I am quite convinced of its value. If a patient comes to us complaining of indigestion and presents a big flabby pale teeth-indented tongue, the cure of the trouble does not lie with drugs for the stomach but with treatment directed to the underlying condition of which dyspepsia is a mere symptom. What this condition may be, has to be discovered and treated before we can cure the indigestion.

In giving any of the above drugs it is important to note exactly what we intend to do with them; thus the alkalies either as bicarbonates or the hydroxides are given almost solely for the purpose of neutralising excess of acid in the stomach, and hence should be given either just before meals or about three hours afterwards. When we give bismuth it is intended to reach the coat of the stomach, and not to spread itself over the food; hence it should be always given when the organ is empty. Acids, again, are meant to reinforce a deficiency (if such ever occur) in the acidity of the gastric juice, and should therefore, as a rule, be taken just at the close of a meal.

In administering these drugs I have gradually evolved the following routine, and for its efficiency I have had abundant reward, viz.:—to let the patient have the last meal of the day at 5 p.m. and then to let him take the medicine, which generally consists of two drachms of subnitrate or carbonate

of bismuth and one drachm of bicarbonate of soda (smaller doses are, I am sure, almost useless) at 10 o'clock at night, at 2 a.m., and at 6 a.m., as nearly as circumstances will allow. These times and doses suit admirably well for those patients who wake up in the night with heartburn or gastric pain, especially if the drugs are combined with 2 minim doses of Tinct. Opii.

*Bed.*—In any case of indigestion which is severe or obstinate enough to resist what one may call the simple advice sketched out above, I have a very strong opinion that a short confinement to bed is very advisable. It has, of course, the one very obvious objection that the active business man, or even the busy housewife or society woman, will not be prepared to devote two or three days in bed to curing what in their eyes is a minor, though troublesome, ailment; I am sure, however, that it is due to a lack of this method of treatment that so many cases fail to be cured.

The great advantage of bed with limited bread-and-milk diet, and the evening administration of bismuth and soda, is that it will almost without any exception cure those cases which lie on the borderland between simple and organic dyspepsia, *i.e.*, those in which, while we have no proof of ulcers, we yet cannot exclude this possibility. Should other methods fail bed *must* be resorted to.





## THE TREATMENT OF LOBAR PNEUMONIA.

By ARTHUR LATHAM, M.D.,

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TRUE lobar pneumonia would appear to be caused, in the large majority of instances, by a specific micro-organism referred to as the pneumococcus and also known as the diplococcus lanceolatus. Other micro-organisms are capable of causing inflammatory changes in the lungs, but these changes are usually of the broncho-pneumonic rather than the lobar pneumonic type. The essential fact is that pneumonia is an infective disease. Recent additions to our knowledge of infective diseases have shown that we can, in many cases, limit the amount of toxic products absorbed, that is to say, limit the amount of auto-inoculation, and in this way limit the severity of the disease and prevent its spread to neighbouring parts. Undue massage of a joint inflamed as the result of pneumococcic, gonococcic, or other infection, leads to a greater absorption of the toxic products, and so to fever and in some cases to extension of the disease to neighbouring parts. Again, it has been shown that heavy percussion of the chest in advanced consumption often has the same effect as an excessive dose of tuberculin, that is to say, it leads to an excessive absorption of toxic products which cause an increase in the degree of fever and lead to an extension of the disease. Anything which leads in pneumonia to a greater amount of blood and lymph passing through the affected portion of the lung, leads to a greater amount of toxic products being swept into the neighbouring portions of the lung and into the general circulation. The most potent factor in causing a freer supply of blood and lymph to the lung is movement. Bodily exertion, increased action of the heart, and increased rate of respiration, all produce a freer circulation through the lung, and in pneumonia tend, by increasing the absorption of toxic products, to increase the severity of the symptoms, and in not a few cases to produce extension of the disease. In my experience it is an undoubted fact that a patient who is treated from the onset of pneumonia

with complete rest, has a better chance of recovery than a patient who is moved in some jolting vehicle to a hospital or other institution on the fourth, fifth, or sixth day of the disease. The obvious conclusion is that in the treatment of lobar pneumonia *complete rest* is essential. We should use every means, once our diagnosis is made, to preserve our patients from undue movement of the body, and to avoid any undue increase in the respirations or excessive action of the heart.

One practical deduction is that the patient should be placed under the same conditions as a patient suffering from enteric fever. He should be kept in bed in what he finds to be the most comfortable position—usually the supine position—and any attempt at movement by his own exertion should be checked. The nurse may naturally shift his position from time to time either when this is requisite for nursing purposes, or when the patient craves for a change of position, but such movements must entail as little exertion on the patient's part as possible. Another practical deduction is that once the diagnosis is made our examination of the patient should be directed to strictly salient points. The elaborate examination of the chest, back and front, once or even twice daily, which is still too common in cases of pneumonia, does nothing but harm. The anxious search of some physicians for the presence of fluid or pus seldom gives any information in the first week of the disease, whilst the careful mapping out, day by day, of the area of consolidation has seldom, if ever, led to any advantage to the patient. Such elaborate physical examinations often mean the difference between recovery and death. Some years ago I had the opportunity of watching the practice of several physicians, in this country and abroad, who were in the habit of making a daily elaborate examination of the chest in this disease, and even of sitting their patients up in bed for this purpose. Their results, when compared with those of their colleagues who were content to let well alone, showed a greatly increased mortality. I do not suggest that no examination of the patient's chest should be made from day to day, but I do suggest that all required information can usually be obtained by light percussion and auscultation, and by a careful examination of the position and size of the heart. The fact

that consolidation is extending is not a fact that gives us useful information. The fact which we want to know, namely, whether the effect of the poison is being better met or less well met from day to day, can be deduced from the symptoms. It is rarely necessary to examine the back of the patient during the acuter stages once the diagnosis is clear, for fluid to any extent is a rare complication of pneumonia, and an empyema rarely gives signs of its presence in the first week. If it should be necessary to examine the patient's back, then the patient should be rolled over gradually and *gently* by the nurse on to the affected side.

In the treatment of pneumonia, then, our first lesson, based both on facts of clinical experience and on scientific investigation, is to refrain from unnecessary movement and meddlesome examination.

Apart from the essential necessity of absolute rest, and apart from vaccine therapy to which allusion is made later, the treatment of pneumonia resolves itself into placing the patient under the best hygienic conditions, supplying a non-flatulent diet, meeting symptoms as they arise, and endeavouring to avoid complications. Medicines may be, and in fact often are, required to sustain the heart and to meet emergencies. There can, however, be no routine treatment. Almost each patient presents a different picture or problem, and the one certain fact is that undue drugging—meddlesome medicine—may do infinite harm. The majority of young patients above three years of age recover if left judiciously alone. The majority of elderly patients die. In the latter class stimulants and heart tonics are called for at an early stage, and common-sense treatment is not infrequently rewarded. Pneumonia in a worn-out, and still more in an alcoholic, subject must be met by active stimulation from the onset, whilst pneumonia accompanied by early and severe nervous disturbance requires our active intervention. Another point to remember is that a patient suffering from pneumonia requires the most constant attention. Most cases mean a big fight, and in many it is only possible to win by applying the necessary remedies at the earliest sign of failure on the part of the patient to meet the attack. A few hours' delay in meeting a suddenly arisen symptom may mean much. Again, we do



not always remember that the crisis is a critical time. A large proportion of the deaths occur after the crisis, and many of them could be prevented by careful stimulation before and during the crisis. This short article cannot deal with the treatment of all possible complications. One remark on such complications, however, may be made. If the temperature fail to drop to the normal within eight days we should remember the possibility of acute pneumonic tuberculosis; whereas if the temperature drop somewhat at the end of six or seven days and then takes a higher level, whilst the daily oscillation becomes greater, we should make an anxious search for the presence of an empyema. If a large empyema forms as a sequel to pneumonia and the patient is much debilitated, it is often wise not to operate at once, but to draw some of the pus off by means of aspiration and to operate twenty-four or forty-eight hours later.

We may now discuss the treatment of pneumonia under the headings (1) General Treatment; (2) Symptomatic Treatment; and (3) Vaccine Treatment.

#### GENERAL TREATMENT.

The patient should be kept, as already has been said, at absolute rest in bed, preferably in the supine position. This procedure should be adopted no matter how mild the symptoms may be, and under no circumstances should the patient be allowed to sit up until the temperature has been normal for some days. Even talking should not be permitted more than is necessary, and in every way the strength should be husbanded. Two good nurses should, if possible, be employed.

The room should be of suitable size, and thoroughly ventilated. Open-air conditions do much to reinforce the efficacy of treatment in pneumonia; and the windows should be kept open, even if the temperature of the room falls to 60° F., or below. Light screens may be placed near the bed to protect the patient from undue currents of air. In hot weather blocks of ice, with an electric fan playing upon them, are of service. The bedclothes should be light, the mattress sufficiently firm. Electric light is the best illuminant, and in its absence candles should be used; the use of gas and oil lamps should

be avoided.

The *sputum* should be carefully collected and destroyed, preferably by burning in sawdust, and the receptacle should be thoroughly disinfected in carbolic acid, 1 in 10. The *mouth* should be kept thoroughly clean, and should be washed out with listerine thrice daily. The *diet*, in most cases, may consist of 2 pints of milk, and one pint of strong beef-tea, in quantities of 5 oz. every two hours when the patient is awake. One or two eggs may be added. The important thing about the diet is that flatulence should not be produced, as respiration becomes hampered when this symptom is marked. It is important that in all cases of pneumonia the condition of the stomach should be ascertained each day. If distension occur, we may add 1 gr. of sodium citrate to each ounce of milk, or we can give whey or albumin water or certain well-known proprietary articles.

If distension does occur beef-tea should be omitted for a time. If it continues a turpentine enema should be given, consisting of 1 oz. ordinary turpentine,  $\frac{1}{2}$  oz. castor oil, the yolk of an egg and 1 pint of warm water. This enema should be given through a long rectal tube, and injected quickly. In all cases of pneumonia patients may be allowed to drink freely of *water*, but should not take more than 1 oz. at a time. The sucking of ice to any extent should be avoided, as this tends to increase flatulence. *Oxygen* is of considerable value, and its use should not be delayed until the later stages. It should be given from the onset for a few minutes at a time several times a day. It is best given through a funnel held a little way from the mouth. The funnel may be placed on the pillow and a small stream of oxygen allowed to escape so that the oxygen breathed by the patient is thoroughly mixed with the air. The oxygen may be passed through a Wolff's bottle containing a little absolute alcohol slightly warmed. This measure has a very stimulating effect in certain instances, but in many the patient dislikes it. At the onset of the attack large hot linseed *poultices* spread on flannel should be applied every 3 hours for 12 hours; the poultice should extend from the spine to the sternum on the affected side. At the end of 12 hours the poultice should be replaced by a cotton-wool

jacket. If this measure is not sufficient to relieve the pain, leeches may be applied, or  $\frac{1}{8}$ th gr. of morphia may be injected hypodermically, and repeated if necessary at the end of 2 hours. The *bowels* should be well opened at the commencement of the disease by 5 grs. of calomel followed in 6 hours by 1 dr. magnesium sulphate. In uncomplicated cases no mixture is required, but 1 gr. sulphate of quinine and a little hydrochloric acid every 6 hours can do little harm. *Stimulants* should not be given as a routine measure. In nearly all cases stimulants are required some time or another, and if we are to obtain the full benefit of them we must very carefully watch our opportunity for using them. If they are given from the onset, their value at the most critical stages of the disease becomes less. As soon as the pulse shows any sign of becoming weak, more rapid, and more compressible, stimulants should be given. The best form of stimulation in cases of pneumonia is by means of hypodermic injections of digitalin,  $\frac{1}{100}$  to  $\frac{1}{50}$  gr., and strychnine,  $\frac{1}{80}$  to  $\frac{1}{30}$  gr., repeated at such intervals as may be called for in the particular case. Alcohol may have to be given in addition. The best form is old brandy; at first, 2 to 3 oz. in the 24 hours, increased if necessary to 12 oz. or more.

*Treatment at the Crisis.*—When the crisis is expected the nurse should not leave the bedside. Extra warm clothes and hot bottles to the extremities should be employed as soon as the crisis occurs. An ounce of brandy in 4 oz. hot water should be given at once, together with a hypodermic injection of digitalin,  $\frac{1}{50}$  gr., and strychnine,  $\frac{1}{80}$  gr.

*Treatment after the Crisis.*—After the crisis the milk and broths should be thickened with arrowroot. A fish diet may be given in most cases at the end of 48 hours if progress is satisfactory. The amount of alcohol now given should be reduced, but if there is any tendency to cardiac failure the use of alcohol, digitalin, and strychnine should be continued. All diaphoretic mixtures which may have been prescribed should be omitted. Ammonium carbonate 4 grs., spirit of chloroform 5 mms., infusion of quassia to the ounce may be given three times daily 10 minutes before meals. If the resolution of the lung is satisfactory the patient may, as a rule, be allowed to sit up in bed within a week of the crisis.



When movement is permitted the effect on the pulse should be carefully watched. Any lasting increase of pulse-rate resulting from a change of posture shows that the effort has been too great, and the progress must be slower. When the patient is allowed to sit up gentle massage of the arms and legs should be prescribed. As soon as the patient is permitted to move about his room liquid extract of cinchona 5 mms., dilute nitric acid 8 mms., syrup of orange 20 mms., chloroform water to the ounce may be given three times a day after meals. In all cases a change to some bracing climate, to complete convalescence, is desirable.

If the resolution of the lung is delayed equal parts of the liniment and tincture of iodine may be applied over the affected part until it is sore. Gentle breathing exercises, together with gentle massage of the chest, may be prescribed. In addition, potassium iodide gr. v., spirit of aromatic ammonia 15 mms., and water to the ounce should be given every 6 hours. If these measures fail, the effect of vaccine therapy should be tried.

#### SYMPTOMATIC TREATMENT.

*Cardiac Failure.*—In slight cases a few leeches should be applied over the right heart. Oxygen, hypodermic injections of digitalin and strychnine, and alcohol should be given freely. In severe cases leeches should be applied, whilst the amount of alcohol may have to be very large, and strychnine may have to be pushed until twitching occurs. Patients often recover from what appears to be desperate heart failure in pneumonia under the influence of judicious stimulation, and no case should be abandoned until death has occurred. If cyanosis is marked, together with epigastric pulsation and prominence of the jugular veins, venesection to the extent of 6 to 8 ounces should be performed.

*Cough.*—This rarely requires very active treatment; expectorants, as a rule, are certainly out of place, and often do harm by interfering with the digestion. The cough, as a rule, is reflex, and serves no purpose in the early stages of the disease. When this form of cough becomes troublesome it is best met by a sedative such as Dover's powder, 5 to 10 grs., or by codeine  $\frac{1}{2}$  to 1 gr. as a pill, thrice daily.

*Insomnia.*—Cold sponging will often bring sleep. If this

fail, the best remedy in the earlier stages of the disease is morphia  $\frac{1}{6}$  gr. by hypodermic injection, repeated in an hour if necessary provided that there is no marked renal inadequacy or copious bronchitis. It is essential that sleep should be obtained, and many remedies, such as sulphonal, trional, and paraldehyde, may be tried, but these usually give disappointing results. The use of veronal is not unattended with danger. We are a little liable to be afraid of morphia in dealing with pneumonia, but in my experience it can be given safely in the great majority of cases during the earlier stages of the disease, provided there is no obvious contra-indication. Small doses, as a rule, are quite sufficient to produce the effect required.

*Nervous Symptoms.*—Mild symptoms of this kind are best met by sponging with tepid water. Severe symptoms, such as delirium, stupor, or great restlessness, call for ice to the head and cold sponging. If necessary the body may be wrapped in a sheet wrung out of water at  $100^{\circ}$  F. and then rubbed with ice. Alcohol should be given in these circumstances in frequent doses, together with the food. If the sleeplessness continue, morphia up to  $\frac{1}{3}$  gr. and  $\frac{1}{100}$  gr. atropine may be given hypodermically.

*Hyperpyrexia.*—Whenever the temperature rises above  $104^{\circ}$  F. the body should be sponged with water at  $80^{\circ}$  F. for 10 minutes. If the temperature continues to rise the body should be wrapped in a sheet wrung out of water at  $100^{\circ}$  F., and then rubbed with ice. If this fail, we may try the effect of a bath rapidly lowered from  $100^{\circ}$  to  $80^{\circ}$  F., for 15 minutes, the patient being very carefully watched for any sign of collapse.

#### VACCINE TREATMENT.

The symptomatic treatment of pneumonia leaves much to be desired. The statistics of the London general hospitals show a mortality of 20 per cent. In other words, one person in five who is treated for this disease dies. Vaccine therapy holds out some prospect that our results will become better in the near future. Boellke has brought forward an encouraging account of the effect of vaccine therapy in about 30 cases of severe pneumonia and in one case of pneumococcic endocar-

ditis. The effects of vaccines in chronic pneumococcic infections and the results of vaccine therapy in other diseases show the necessity of investigating thoroughly the value of vaccine therapy in acute pneumonia. My own experience is, on the whole, encouraging. In several cases in which the patients' physique was good, and in which, in any event, a recovery appeared to be probable, the use of a pneumococcic vaccine has been coincident with a rapid improvement. In some of these instances the crisis has occurred on the second, third, or fourth day, apparently as the result of the vaccine, and recovery has been uneventful. So far as my own experience goes, vaccine therapy has not been of service in severe attacks in debilitated or elderly people. Further, there can be no question that an excessive dose may lead to the spread of the disease to the other lung, or to the formation of an empyema. A vaccine prepared from the patient's own strain acts better than a "stock" vaccine, but the preparation of the patient's own vaccine, although it may be done in 24 to 48 hours, is not always possible, and, in any event, means some loss of valuable time. The dosage to employ remains to be worked out. The fact that very different results are obtained points to the varying potency of the "stock" vaccines on the market. The initial dose must be in accordance with the age and physique of the patient, the severity of the disease, and the day of the symptoms. It is rarely wise to give a larger initial dose than 10 millions. The result can be well watched on the temperature record, and it is doubtful whether even frequent readings of the opsonic index give us any further information. If a dose is followed by a lowering of the temperature it has done good. If the temperature then rise again, we may repeat the dose (or give a slightly larger one in some cases) at an interval of 36 to 48 hours from the first dose. If a dose is followed by a rise in the temperature it has been too great. If a dose has no effect on the height or range of the temperature or on the symptoms we may give a larger one in 36 to 48 hours.

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## HEADACHE.

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EVERYONE is familiar with those much-to-be-envied persons who proudly boast that they have never known what it is to have a headache in their lives. Although it is possible to cause severe headache, or pain in the head, in these individuals by one or other of the local causes affecting the scalp or other coverings of the brain, yet this natural immunity from headaches is an illustration of the immense importance of constitutional causes in their production, especially the various forms of neuralgic and periodic headaches.

The number of different causes which may give rise to headache is very large, and in an endeavour to understand an obscure case, where the headache is a prominent symptom and its cause not obvious, it is a considerable advantage to have a working classification of the causes of headache, based on rational lines, in order to aid us in arriving at a diagnosis, inasmuch as the recognition of the cause of this symptom will help considerably in indicating the appropriate treatment. In the following anatomical classification which I use I have indicated under the different headings only the more common causes :—

SUPERFICIAL.—1. *Diseases of the Brain Coverings.*—(a) *Scalp*—for example, cellulitis; weight of hat or mass of hair; blow on the head. (b) *Pericranium*—for example, rheumatic. (c) *Bone*—for example, tuberculous or syphilitic caries; frontal sinusitis. 2. *Reflex Visceral Neuralgias of Scalp.*—Ocular, dental, pulmonary, cardiac, gastric, etc.

DEEP.—3. *Reflex Cortical Neuralgia.*—Visual “Academy” headache; thunderstorm, neurasthenia. 4. *Toxæmic.*—Constipation and sluggish liver; influenza and other fevers; foul air; alcohol; ether. 5. *Increased Intracranial Pressure.*—Cerebral tumour and abscess; acute encephalitis; hydrocephalus; cerebral hæmorrhage; cerebral oedema in chlorosis and arterio-

sclerosis; sinus thrombosis; meningitis; tight neckband; migraine; epilepsy.

1. *Diseases of the Brain Coverings.*—It appears certain that the brain substance is insensible to ordinary tactile and painful stimuli, and that the actual mechanism of the production of the headache is mainly by means of painful stimuli to nerves supplying the coverings of the brain or its vessels.

2. *Reflex Visceral Neuralgias of the Scalp.*—This is an important group. The ocular headaches due to errors of refraction are well known to all, and are caused by the irregular and excessive strain of the ciliary muscle set up by the chronic effort to overcome slight errors of refraction, especially astigmatism. Excessive sensory stimuli are thus constantly being started from the sensory fifth nerve branches supplying the ciliary muscle and its attachments in the sclerotic, and thus is set up irritability in the sensory nucleus of the fifth nerve, so that other skin areas supplied by the fifth nerve become tender and appear to be the source of the pain. Thus is caused the supra-orbital headache of errors of refraction, and in some cases the pain is further reflected to the back of the head and neck. In iritis and glaucoma the pain is usually temporal. Dental neuralgia rarely causes headache, the pain radiating over the face on the same side, or in the ear and temple. More common is it for dental neuralgia to be mistaken for tic douloureux, the severe trigeminal neuralgia. Much less known are the local neuralgic headaches due to diseases of the viscera in the chest and abdomen, though Head has described them fully. This is to be explained through the distribution of the vagus nerve to the lungs, heart, stomach and intestines, and liver, so that lesions of these viscera, which cause reflected cutaneous pain and tenderness of the skin according to their corresponding spinal segment, may at the same time reflect afferent impressions through the vagus to the medulla, and so, through the agency of the cutaneous supply of the head, definite areas of the scalp may become tender and painful in association with visceral disease. This is well illustrated by the vertical headache which so often immediately follows the ingestion of a large quantity of ice-cream into the stomach. A good example also of this reflected tenderness of the skin of the corresponding spinal segment

and reflected headache I saw not long ago in a young woman with left apical phthisis. Her complaint was of neuralgic pain on the left side of the neck, back of head and ear, implicating the second, third, and fourth cervical areas, with reflected supra-orbital headache on the same side. When she coughed, she always put the palm of her left hand over her eyebrow to ease the pain, which, she said, felt "as though all the brains were coming out." Pain at the back of the head may be due to spinal disease in the upper cervical region, implicating the second and third cervical levels, and I have now attending my out-patient a man with syringo-myelia, whose chief complaint is of pain over the occipital region on both sides, although this area is completely insensitive to pin-prick.

3. *Reflex Cortical Neuralgia*.—Although the cerebral cortex has been proved to be insensitive to ordinary painful stimuli, it is certain that painful impressions may be set up by stimuli not painful in themselves, from viscera in no way diseased. Under this group of neuralgic headaches will be included the peculiar visual headache produced by continual change of focus and attention, such as is produced by a visit to a picture gallery, or by watching the flickering of reflected light on moving water, a crowded racecourse, theatre scene, etc.

Similarly, electrical disturbances of the atmosphere affect some people peculiarly, causing headache. This peculiar susceptibility to the approach of a thunderstorm may be more marked in childhood, and may disappear in adult life. It is usually much more pronounced in individuals who are prone to other forms of neuralgia.<sup>1</sup> Neurasthenic and hysterical headaches are frequently vertical, and the sensation as of a nail being driven into the top of the head may be complained of—the hysterical "clavus." It is usually a sensation of weight or pressure on the top of the head, as though the head were being crushed in, but occasionally the pain may be frontal or occipital.

4. *Toxæmic Headache*.—Drugs, such as alcohol or ether, are frequent causes of headache, even a small proportion of the vapour of ether in the air of a room being sufficient to cause

<sup>1</sup> Neuralgic headache is frequently unilateral, and is apt to be mistaken for migraine. It is, however, never preceded by the visual spectra, tinglings, motor weakness, or aphasia that characterise true migraine.



headache in some persons. It has been stated that the headache following excess of wine drinking is due to an œdema of the brain, a lymphatic headache, due to the acids in the wine precipitating the calcium salts in the blood, and thus diminishing the coagulability of the blood. Such headaches may sometimes be quickly relieved by a dose of 30 grains of calcium lactate.

Constipation is a common cause of headache, which may be periodic, and may simulate migraine. The cause in these cases is obvious, and the patients are nearly always aware of the relation of the headaches to increase of the constipation, though rarely do they manage the purgatives they use in the proper way. Instead of taking daily a sufficient laxative, saline by preference, to produce an easy motion, they invariably get into the habit of waiting until the constipation is pronounced before taking a pill. This difference in treatment is quite sufficient to cause repeated severe headaches.

5. *Increased Intracranial Pressure* is a most important cause of headache. In chlorosis and in arterio-sclerosis there is liability to cerebral œdema, produced in different ways—in the one due to a deficient quality of the blood, in the other due to the high blood-pressure, the arterio-capillary spasm producing a relative anæmia inside the closed cavity of the cranium. The appropriate treatment by vaso-dilators, such as nitro-glycerine, often produces immediate and marked benefit in cases of persistent headache due to arterio-sclerosis which have proved refractory to phenacetin, bromides, and similar methods of treatment. On the other hand, it is to be remembered that such vaso-dilators as nitro-glycerine sometimes set up headache, by increasing the flow of blood in the meningeal vessels disproportionately, and thus causing congestive headache.

In cerebral tumour and in meningitis the intense headache is due to the general increase of intracranial pressure set up, causing pain by distant indirect pressure upon the nerve filaments supplying the membranes. For this reason the headache in these conditions is apt to be general, or at least it is of no localising value. When there is a local meningitis, or a cerebral tumour is involving the surface membranes, then there is apt to be local headache, and especially tenderness

on deep pressure on the scalp, which is often of the greatest service in localising the site of the intracranial mischief. When a cerebral tumour involves the cortex of the parietal, or temporo-sphenoidal lobe, or frontal region, there may be no localising signs whatever beyond this deep tenderness on pressure, which is then of inestimable value.

The severe headache met with in acute and chronic meningitis, syphilitic endarteritis, gummata of the membranes, etc., need only be mentioned. The extreme severity and persistence of the pain, especially at night, in chronic syphilitic meningitis, is characteristic.

Headache is very frequent and often persistent, following head injuries, possibly due to fractured base, cortical lacerations, and hæmorrhages. A more or less lasting state of traumatic neurasthenia may be produced, especially if the patient is not kept at rest for a sufficient period at first.

Migraine in its typical form is frequently hereditary, and bears a close relationship to other neuroses, such as neuralgias, asthma, torticollis, epilepsy, etc. It is especially its relationship to epilepsy that is perhaps the most interesting. Frequently migraine that has lasted for years from early childhood becomes epilepsy in later life, and I have several times seen the same aura of the colour scotoma precede the fits which used previously to be associated with hemianopia and migraine headache. In one case I have seen recently, where the fits are very frequent, the migraine still persists and alternates with the epileptic attacks, the same colour scotoma and hemianopia being observed in both. The cause of the headache in migraine is almost certainly congestive, due to dilatation of the superficial arteries following the initial vasomotor spasm which produces the auræ of hemianopia, colour spectrum, tinglings, aphasia, etc. To relieve the actual pain cardiac depressants, such as chloral and the coal-tar analgesics, are often successful by lowering blood pressure, the patient being kept quiet lying down, with the head as high as possible. Ten grains of Dover's powder, followed by a hot drink containing one-sixth of a grain of nitrate of pilocarpin promote perspiration and may give speedy relief.

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## JAUNDICE.

By GUTHRIE RANKIN, M.D., F.R.C.P.,

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IN the following case the most prominent objective symptom was jaundice :—

The patient was a man of 29 years of age, who was a ship-steward, and who had been in hospital for eight weeks before the jaundice showed any sign of passing off. When he was admitted, he complained chiefly of nausea, loss of appetite, and weakness, but there were no physical signs of disease in any organ. The history of the onset of his illness, and the absence of physical signs, made it appear that the cause was an ordinary catarrhal condition of his bile-ducts, but the persistence of the condition over so long a time, despite the exhibition of all the usual remedies, began to arouse suspicions that behind the jaundice there might be some serious lesion which had not been recognised. Within a week an improvement set in, and gradually the discolouration of the skin cleared up, the excretions resumed their normal appearance, and the man became quite well.

In a bed not far from this patient there lay another man who was of about the same age, and who also came to us on account of jaundice. But in his case there was a history of progressive emaciation extending over many months, and examination of the abdomen revealed the presence of an enlarged and nodular liver with glandular masses in the groins and axillæ, and with undoubted evidence otherwise of malignant disease.

At the Waterloo Hospital I have recently had two patients in whom jaundice was the conspicuous sign.

One of them, a woman of 38 years of age, had been persistently jaundiced for at least two years. The depth of colouring in her skin varied from time to time, but the discolouration never entirely disappeared. At intervals she complained of shiveriness, sickness, headache, and pyrexia, and after the occurrence of these symptoms the jaundice always became deeper, and she was conscious of pain and fulness in the hepatic region. On examination, the liver was found to be considerably enlarged, smooth and slightly tender to deep pressure; the spleen also could be felt; the urine contained bile, but the stools were never clay-coloured, on the contrary, they were usually darker than normal. This patient was seen, from time to time, over a period of several months, but she then ceased coming to hospital, and the ultimate result of her illness is unknown.

The other, a stout woman of 56 years, was admitted with deep jaundice



and a history of a characteristic attack of gall-colic three days previously. This attack was one of many she had suffered from and was described, in the usual way, as beginning with sudden acute pain in the right hypochondrium, accompanied by active sickness, terminating as suddenly as it commenced, and followed by jaundice. Operation was declined and gall-stones were never actually found in the fæces, but there could be little doubt that they were the cause of the attacks, and, in confirmation of the theory, her gall-bladder could be felt, and was distinctly tender on manipulation.

Yet one more case, this time a private patient. A man, of 50 years of age, came under observation after having been laid up for ten days with jaundice which was gradually becoming more intense, complete anorexia, epigastric tenderness, and repeated attacks of pain, more or less severe, which were referred to the upper part of the abdomen. There was a history, during the previous two or three years, of occasional attacks of similar but less severe pain, followed by disturbance of digestion, and always by an unusually copious discharge of lithates, but never, until now, by jaundice. The patient came of a gouty family, worked hard, was temperate in his habits, and had not previously suffered from serious illness except once, twelve years previously, when he went through a mild attack of enteric fever. Within a few days after being first seen he had a severe rigor, and his temperature mounted to  $104^{\circ}$  F. This was followed, within the two following days, by three similar attacks, and by slight delirium and rapidly progressive emaciation. The jaundice deepened from day to day: the stools were clay-coloured, and the urine was loaded with bile. His condition was regarded as one of acute cholecystitis, following upon a gall-stone impacted in the common duct, and an operation was decided upon. Before operation, Cammidge's test was applied to the urine, which was found to give the reaction said to be characteristic of pancreatitis. At the operation, which was undertaken under conditions of extreme gravity, no stones were found either in the gall-bladder or common duct, but the bile was well on the way to becoming purulent, and the pancreas was swollen, and in a condition of acute inflammation. The gall-bladder was drained, and the patient made a good recovery.

Here we have five cases exemplifying widely different forms of disease, and all possessing one common feature, viz., jaundice. Other two conditions in which jaundice is common may be mentioned in passing, namely, syphilitic disease of the liver and acute yellow atrophy of the liver; but these ailments are rare as compared with those of which the foregoing cases are examples. There is also an infantile form of icterus which, though well known, is uncommon. In my own experience, I remember, many years ago, being brought in contact with a family, of which the first three children developed jaundice shortly after birth, and died within a few days. In the case of one of these children a post-mortem examination

was obtained, and an imperfect common duct was found.

In ordinary cases of jaundice the skin is more or less deeply yellow. This icterus must be distinguished from the yellowish colour of the skin met with in pernicious anæmia, or chlorosis, in the cachexia of malaria or malignant disease, or in Addison's disease. In true jaundice the change in the colour of the skin is accompanied by a similar yellow discolouration of the conjunctivæ, and by a more or less deep staining of the urine from the presence of biliary pigment. The hue may vary from a light saffron, through all shades of yellow, to a deep brown colour, almost like that of porter. When the obstruction causing the jaundice is complete, the fæces become white or clay coloured, are often very offensive, and sometimes are seen to contain fat. In all cases of jaundice, from whatever cause arising, it is common for the patient to complain of nausea and other digestive disturbances, of a bitter taste in the mouth, and of distressing itching of the skin. The pulse is often abnormally slow, hæmorrhages into the skin or from the mucous membranes are not uncommon, and delirium, with other evidences of cerebral disturbance, sometimes occurs.

It was formerly believed that jaundice might be, in some instances—where, for example, it occurs in a mild form as an accompaniment of one or other of the infectious diseases—due to the formation in the blood of bile pigment from abnormal destruction of hæmoglobin. This condition was classified as hæmatogenous, in contradistinction to the variety associated with manifest obstructive changes in the bile-passages and called hepatogenous. It is now, however, recognised that all forms of jaundice are really the result of obstruction to the bile-flow either in the hepatic or common bile-duct, or in the minute bile-ducts throughout the liver, with consequent absorption of the retained bile by the lymphatics. When there is complete obstruction, as from a gall-stone, within the common duct, or from a tumour pressing upon it from without, the bile is entirely prevented from reaching the intestine, with the result that the fæces become white. But minor degrees of obstruction may take place in the smaller ducts within the liver substance, and give rise to varying degrees of icterus without the fæces becoming

wholly deprived of the biliary colouring matter. Bile is secreted under very low pressure, and any cause which increases its viscosity, such as simple catarrh, toxæmic conditions, certain mercurial poisons, etc., favours its absorption by the lymphatics, which rapidly convey it into the blood stream.

There is no difficulty in the recognition of jaundice when once it has become established, though in its minor and earlier manifestations it is sometimes doubtful whether the muddiness of the skin, which accompanies all sluggish conditions of the portal circulation, is the commencement of a true icterus or not. In every case in which jaundice becomes a distinct symptom, the great and important difficulty consists in differentiating the cause upon which it depends, because, obviously, on a just appreciation of the ætiology both prognosis and treatment depend. The cases which have been related give a fair indication of the variety of lesions with which jaundice may be associated, and show at once how widely different the treatment must be in one set of circumstances compared with another.

In all patients in whom jaundice is a comparatively recent development, and in whom no obvious lesion can be found to account for it, but in whom the discolouration of the skin is accompanied by nausea, malaise, disturbed digestion, and headache, it may be hoped that a passing catarrh of the smaller ducts within the liver is the explanatory cause. When malignant or other tumours are responsible for jaundice the pigmentation may vary somewhat in intensity, but it never altogether clears up. It gradually deepens from week to week, and becomes ultimately associated with evidences of new growth, either in the liver or elsewhere. In gall-stone cases the history of acute colic, recurrent attacks, and sometimes the discovery of tenderness or enlargement of the gall-bladder, or of actual gall-stones in the fæces, make the diagnosis easy. But here it must always be borne in mind that gall-stones may co-exist with malignant disease, and in the opinion of some observers their presence for a sufficiently long time in the gall-bladder may be responsible for its production. In cases of cirrhosis of the liver, the enlarged size of that organ and the persistence of the icterus, with repeated pyrexial attacks, as in the case quoted, guide us to the correct



differentiation. Or in those instances where it develops in the later stages of the multilobular variety of cirrhosis, the accompaniment of ascites, hæmatemesis, and enlargement of the veins on the surface of the abdomen afford a clear explanation of the cause. The most difficult cases are those in which pancreatic disease is the factor upon which the jaundice depends. Until comparatively recently so little was known about disorders of the pancreas, and so little could be done for their relief, that cases of jaundice which were pancreatic in origin must have been misunderstood, and in many instances attributed to a wrong cause. Now, thanks to the enormous advances of abdominal surgery, the pancreas is coming to be regarded with greater interest, and its disorders are being brought within the field of curative treatment. The main facts upon which jaundice of pancreatic origin may be suspected are the occurrence of deep-seated pain in the epigastric region, the existence in some cases of a firm, tender mass reaching across the upper part of the abdomen behind the stomach, the presence of fat in the stools, a positive reaction to Cammidge's pancreatic tests in the urine, a rapid and progressive emaciation, and a tendency to the early development of rigors and pyrexia. Acute yellow atrophy of the liver is of rare occurrence, but its existence as the cause of jaundice would be suggested by the prominence of cerebral symptoms, rapid diminution of the area of hepatic dulness and pain in that region, a general hæmorrhagic tendency, and the presence of leucin and tyrosin in the urine.

The prognosis in catarrhal jaundice is always favourable. In malignant disease it is hopeless. In cases in which inspissation of the bile or gall-stones cause jaundice the outlook is favourable if by medical measures the bile is restored to its normal viscosity, or if by surgical interference the stones are removed. The jaundice of unilobular cirrhosis is not immediately serious, but its complete disappearance is seldom effected. That of multilobular cirrhosis is a terminal symptom which persists to the end. In pancreatic cases the prognosis is always serious, but, just as in inflammation of other organs, the pancreas may respond to treatment, medical or surgical, and recover; though it must be remembered that it possesses a special liability to suppurative and hæmorrhagic complications, which frequently occur within a day or two of the onset

of the illness, and very often lead to a fatal termination.

The congenital variety of the disease is usually the result of a malformation which cannot be rectified or of syphilis; but a mild icterus is also met with in babies which appears soon after birth, is of moderate intensity, and subsides spontaneously after a week or two.

Treatment must vary according to the cause upon which the jaundice depends. In the simple catarrhal variety of the disease the food should be bland and simple. Meat and fats are best given sparingly; variety enough can be found in milk foods, white fish, eggs, chicken, and game. Diluents should be taken freely, barley-water or milk well diluted with Vichy or soda water being among the best, and every morning before getting up, half a pint of piping hot water should be sipped slowly. A fair amount of exercise should be taken daily in the open air, but over-fatigue is to be guarded against. If the liver is enlarged and painful, hot packs for an hour at a time help to reduce its size, and to relieve the tenderness. As regards medicines, there is no more useful drug than calomel, and, in my experience, it is best given in small and frequently repeated doses; one-quarter of a grain three times a day answers well in most cases. Probably there will be no aperient result, but this must be provided for by a morning dose of Carlsbad salts. With the calomel may be combined such a mixture as the following:—Chloride of ammonium, 20 grains; tincture of euonymin, 20 minims; tincture of ginger, 15 minims; and decoction of taraxacum to one ounce; three times daily. In malignant cases the treatment can be palliative only, unless the growth is so situated as to be capable of removal by operation.

The cases which are dependent upon hepatic cirrhosis must likewise be treated palliatively, but there is some hope in many of them that improvement may follow the use of suitable drugs, and that the more troublesome symptoms may be considerably relieved. When gall-stones are the cause, their removal by the surgeon is the only sure way of curing the attacks of colic and jaundice which arise from their presence. But in those cases in which operation is refused, or, when for one reason or other it is undesirable, much good is often obtained from the administration of olive oil. I am fully aware that its value as a remedy in these cases has

been questioned, and even ridiculed, but I am able to state from personal evidence that in certain cases it possesses undoubted value. I have notes of many cases in which the freedom from attacks of gall-colic, after the exhibition of olive oil, has been so striking as to be convincing. One dose a day of from one to two ounces is sufficient, and is best taken at bedtime.

Lastly, the variety of jaundice which depends upon pancreatitis demands careful and prompt treatment. It may be difficult, or impossible, at first to be sure that a case is of pancreatic origin; probably many attacks of jaundice which are recovered from arise from this source. A duodenal infection may readily enough find its way up the bile and pancreatic ducts, and, according to its intensity, may produce either a simple catarrh or an acute cholecystitis and pancreatitis. When the latter event occurs the pancreas may become so rapidly acutely inflamed that time is of the greatest importance. If ordinary methods of medicinal and dietetic treatment fail to remove jaundice within a reasonable time, the possibility of a pancreatic cause should always be kept in view. On the first intimation that the progress of the condition threatens to become acute, the services of the surgeon should be requisitioned in order that the question of drainage of the bile and pancreatic ducts may be discussed. If justifiable, the necessary operation is best performed while the infection is still in the early or sub-acute stage, and before the onset of rigors, high temperature, and other constitutional symptoms, indicative of an acute septicæmia, set in. Sufficient attention is not paid by the text-books to the jaundice which depends upon an inflammatory lesion of the pancreas, nor are directions clearly enough expressed for the proper management of such cases, and for the essential interference of the surgeon at an early enough period in the history of the illness. It seems to be certain that many patients who die of acute pancreatitis might be saved, if it were more generally recognised that drainage of the gall-bladder at a sufficiently early stage is often capable of preventing a fatal sepsis. Cases which depend upon some form of new growth in the head of the pancreas must be considered, from the treatment point of view, on their own merits.



## THE COMMON COLD.

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AMONG the minor maladies of civilised man the "common cold" takes a prominent place. Not a few are made miserable by it, or even placed *hors de combat*, for a considerable portion of their lives. By a "common cold" I mean an acute catarrh, tending to run a definite course, limited to days or weeks, of some part of the mucous lining of the upper respiratory tract and contiguous regions (frontal sinuses, maxillary sinuses, nasal ducts, conjunctivæ, etc.). In this paper I shall employ the terms "cold" and "catarrh" synonymously with "common cold."

There is good reason to believe that an acute catarrhal condition of these regions may arise from purely nervous causes, *i.e.*, from vaso-motor and trophic disturbances, independently of any infective agent. This may be the case, *e.g.*, with some forms of "hay fever," which strongly suggest a condition allied to urticaria, one which may occur without obvious exciting cause or result from some food irritant (*e.g.*, fruit, shell-fish), or exposure to "dust" of various kinds. A purely nervous cold may result from the mere apprehension of it, as I can vouch from personal observation. In the great majority of cases, however, a cold is the result of specific bacterial infection.

There are several kinds of organisms capable of causing a cold. This term does not, therefore, answer to one specific malady, but connotes several distinct maladies which it is convenient to group together under a generic name. Among the more "common cold" organisms are the following:—Friedländer's bacillus. The *Bacillus septicus*. The *Bacillus* of influenza. The *Micrococcus catarrhalis*. These organisms give rise in the susceptible to specific febrile disorders; but, unlike the exanthemata, these disorders do not confer immunity for more than a very limited period, sometimes for not more than a few weeks.

Individuals differ considerably in regard to their susceptibility to the organisms in question. Some appear to be immune to all of them: they may be exposed over and over again

to infection and yet escape unhurt; others show intense susceptibility to one or more of them. It seems likely that in process of time civilised man will be rendered increasingly resistant to "cold" organisms by the operation of natural selection; for on the whole those who are the most resistant to the minor maladies of life are the most likely to survive and to leave progeny, to whom they tend to transmit their superior resisting power. It has to be remembered that primitive man wandered about in small groups, and spent most of his time in the open, so that he was far less exposed to microbic infection than is modern civilised man, who is not only enveloped in clothes which tend to harbour infective organisms, but is constantly exposed to infection by reason of his gregarious habits and confined mode of life. Thus it is that a common cold is apt to spread like wildfire among members of a household, or among bodies of people assembled under one roof, as at church and at the theatre.

Quite recently I saw at the Pasteur Institute at Paris a young chimpanzee suffering from a bad cold in the head, doubtless caught from some human congener. We may safely conclude that in the native forest haunts of these creatures there is little or no risk of such infection.

*Symptomatology.*—Seeing that a common cold may result (probably) from simple nervous disturbance independently of infection, and, again, that it may be due to several different kinds of organisms, which vary considerably in different epidemics; seeing, moreover, that individuals respond very variously to the same organisms, it follows that the symptomatology of a common cold presents wide differences in different individuals and in different epidemics. The local manifestations vary from slight to the most intense catarrh of any portion of the mucous membrane referred to, giving rise to nasal obstruction, sneezing, coryza, pain on swallowing, loss of voice, and the like; the constitutional symptoms may be entirely absent, or the patient may be so ill with fever, headache, pains in the limbs, etc. that he is compelled to take to bed.

*Prophylactic Treatment.*—Much the most important branch of treatment is, of course, that which aims at prevention. Mouth breathers, those who suffer from adenoids or enlarged tonsils, or indeed from any chronic affection of the nose or

throat, are more liable to catch colds than others. If any such affection is present it should, therefore, promptly be treated.

In the next place every endeavour should be made to improve the health generally. To this end stuffy and overheated rooms should be avoided; the bedroom windows should be kept widely open at night; a cold bath should be taken in the morning (provided, of course, it can be tolerated). On no account should the body be clothed too warmly or too heavily. This precaution is particularly necessary in the case of the upper part of the chest and of the neck: the latter is, indeed, best left bare.

Those who are liable to colds need to be specially careful in the matter of their food. Much may be done in this way to ward off a tendency to catch cold. Both over-eating and the eating of wrong kinds of food may engender the catarrhal diathesis. Not only are those who over-feed especially liable to catch cold, but when they contract one it is very apt to become chronic. When we can persuade an over-fed chronic bronchitic patient to cut his food down to legitimate proportions we have taken the most important step towards curing him. I have, indeed, more than once completely starved out, so to say, a catarrhal habit.

As showing how the taking of wrong kinds of food promotes the occurrence of catarrhs, I may refer to their great frequency among improperly-fed children. Practically all the very young children of the London poor, *e.g.*, suffer from inflammation of some portion of the upper respiratory tract, notably from rhinitis and bronchitis. I have been accustomed to attribute this to the absorption of poisons from the alimentary tract, but whatever the exact explanation there can be no doubt that improper feeding is a causative factor, and that the best way to eradicate the trouble in these cases is to correct the disordered state of the digestive apparatus by enforcing a suitable dietary.

In regulating the diet of those who are liable to colds, we shall generally do more good by cutting down the supply of starch and sugar than by curtailing the animal food. It is largely because the children of the poor are deluged with starch that they suffer from chronic indigestion and catarrh.

My advice, then, to those who are liable to colds is to



partake in moderation of plain foods, and to be specially careful not to indulge in an excess of starch or sugar. I have suggested that the absorption of poisons from the digestive tract may be a factor in the causation of catarrh; and, if such is the case, the importance of preventing constipation in those who are liable to colds is obvious. The beneficial effects of purgation in all forms of inflammation has long been recognised.

*Prophylaxis by means of Drugs and Vaccines.*—The treatment by vaccines will be dealt with under a separate heading. As regards prophylactic drugs, quinine stands foremost. It should be given in ample doses, say, grs. iii. to iv., three or four times daily.

*Prophylaxis by the Avoidance of Infection.*—One way of escaping from colds is to avoid as far as possible the infective agents. During the occurrence of an epidemic it is well, e.g., to avoid omnibuses as well as theatres and other public buildings. Their imperfect ventilation renders them hot-beds of infection. Two special precautions for the avoidance of infection, whether of common colds or other diseases, should never be forgotten, i.e., always to breathe through the nose, and never to allow the hands to handle food or to be put to the mouth without having first been washed. I believe that a great deal of illness might be avoided by taking these simple precautions. After exposure to infection it is a good plan to douche the nose and gargle the throat with a mild antiseptic such as boracic acid.

*Curative Measures.*—The treatment by orthodox means of a cold already contracted can hardly be regarded as satisfactory. I allude to such treatment as warm baths, hot mustard foot-baths, purgation, Dover's powder (grs. x. at onset), quinine, aspirin, salicylate of soda, and by antiseptic nasal douches and gargles. Treatment of this sort may help to relieve symptoms and it gives the patients and friends the satisfaction of feeling that something is being done for them, but in the case of infective colds, at least, it does little or nothing to attack the *fons et origo* of the trouble. Undoubtedly the most scientific and satisfactory way of treating this class of disorders is by means of vaccines.

*Vaccine Therapy.*—By means of vaccine therapy, not only are we able to cut short an acute cold, but also to confer considerable immunity against future attacks. By this method

we can, further, often successfully treat colds which have become chronic, *e.g.*, chronic rhinitis, laryngitis, bronchitis, etc.

In but few cases of common cold can a stock vaccine be employed with much hope of success ; except in the case of the bacillus septus we are not likely to do good by any vaccine other than that prepared from the patient's own person.

Perhaps the time will come when every practitioner will prepare his own vaccines. For the present, however, few possess the necessary time or skill, and must, therefore, be content to entrust the preparation of them to experts, the task of the practitioner being confined to collecting and forwarding the infecting material for the preparation of the vaccine, injecting the vaccine when prepared, and regulating the dose after the first injection according to the effects produced.

For receiving the secretion from the inflamed mucous membrane of the nose, throat, or air tubes, small wide-necked bottles fitted with glass stoppers are required. These should be sterilised by boiling. When it is desired to collect the nasal secretion, the external nasal orifices, which always contain an abundance of micro-organisms, should be washed with warm soap-and-water, and dried with a clean towel. One nostril is then closed and the discharge is expelled direct into the bottle.

The best time to collect a sample of the discharge from the naso-pharynx, the throat, or the tubes, is the first thing in the morning, when it is least likely to be mixed with food-particles, and when, moreover, a "uniform smear" (*i.e.*, one in which the contained micro-organisms are present in their true proportion) is most likely to be secured. The secretion should be hawked up or coughed up into the bottle, but prior to this the teeth should be thoroughly brushed, the mouth rinsed, and the throat gargled with boiled or preferably distilled water, after which some of the pure water should be swallowed.

Here a word of caution must be uttered. Unfortunately the vast majority of the people of this country suffer from pyorrhœa alveolaris, a disease which (as I have more than once insisted) is mainly due to the inadequate use of the teeth, resulting from our present system of pap-feeding. Now, the pus which pours out of the diseased sockets in this affection contains, in addition to other micro-organisms, micrococci

catarrhales, pneumococci, streptococci, and staphylococci, and constitutes a constant source of infection of the throat and neighbouring parts. When we consider the propinquity of the posterior molar teeth to the Eustachian tubes, the danger of these latter being infected from these teeth becomes obvious.

It is therefore of the utmost importance to remove this source of infection before attempting to treat any chronic infective inflammation of the mucous membrane of the pharynx and neighbouring parts. Happily pyorrhœa alveolaris can in most cases be cured by modern dental methods.

Having secured the specimen it is forwarded to an expert, and the vaccine can be prepared ready for use within forty-eight hours of its receipt.

The best time for the injection is the evening, and the best spot the flank slightly above and internal to the anterior superior spine. If the reaction is pronounced it may be necessary to keep the patient in bed for twenty-four hours.

An ordinary hypodermic syringe may be employed. It should be boiled in water before use (some prefer to boil the needle in absolute alcohol), and the skin of the spot selected for injection should be well rubbed with a piece of cotton wool soaked in a mixture of alcohol and ether, or in a two per cent. solution of lysol. It is always advisable to begin with a small dose (*e.g.*, 120 million organisms), and to regulate subsequent doses according to the resulting reaction, the subsequent bacterial findings, and the effect upon the local secretion. As a rule the second injection should be about ten days after the first. We do not seek to produce any reaction when the injection is administered during an acute cold, but in the case of chronic inflammatory conditions, or for prophylactic purposes, we endeavour to produce a definite but not too pronounced reaction. Such a reaction displays itself as a tender red swelling at the seat of the injection (which appears in from four to eight hours, and begins to subside in about eighteen to twenty-four hours), and in the form of constitutional symptoms, such as fever and headache, which set in a few hours after the injection and subside during the second twelve hours.

For information on the subject of the preparation of the vaccine the reader is referred to Dr. R. W. Allen's work.<sup>1</sup>

<sup>1</sup> R. W. Allen: *Vaccine Therapy and the Opsonic Method of Treatment*.



## NEURALGIA.

By PURVES STEWART, M.D., F.R.C.P.,

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NEURALGIA may be defined as paroxysmal pain either in the area of cutaneous distribution of a sensory nerve or along the course of a nerve-trunk. Pain thus localised must be produced by a morbid condition somewhere in the sensory path. Our first duty, therefore, in every case is to search for evidence of some local exciting cause. If this be present, the neuralgia is symptomatic of an organic irritation. In many cases, however, no signs of organic trouble can be found. These are the so-called "idiopathic" cases. This does not mean that no lesion exists, but merely that the morbid process, possibly a transient molecular or bio-chemical change in certain sensory cells, is not recognisable by our present methods. We must not forget that pain sometimes occurs also in the distribution of splanchnic nerves, as in certain visceral pains, *e.g.*, in gastro-intestinal, renal, or uterine diseases, but the term "neuralgia" is ordinarily restricted to pain affecting the area of a cerebro-spinal nerve, and to this class of pain we shall confine our attention in the following pages.

*Ætiology.*—"Symptomatic" neuralgia resulting from organic irritation occurs in the various forms of neuritis from whatever cause; also in tumours and aneurisms, and in syphilitic, tuberculous, or inflammatory affections compressing or infiltrating sensory nerve-trunks or nerve-endings. Such cases are usually recognised by the presence, in addition to neuralgic pain, of other sensory phenomena, *e.g.*, blunting or perversion of cutaneous sensibility in the painful area, sometimes by the occurrence of trophic changes in the skin or its appendages, as in the bullæ of herpes or the glossy skin of peripheral neuritis, or, if the nerve-trunk be a mixed one, by motor signs, such as muscular weakness and atrophy, alteration of electrical reactions, diminution of deep reflexes, etc.

In cases of pure or "idiopathic" neuralgia we have to look for predisposing and exciting causes. First as to the predisposing causes—the age of the patient is a factor.

Neuralgia rarely occurs in childhood, and, except for severe forms, such as *tic douloureux*, old people are largely exempt. The malady is essentially one of the active years of adult life and especially of middle age. Male patients are more frequently affected than are females, although the liability of women is increased during pregnancy, the puerperium, and the menopause. Patients with neuropathic, gouty, or rheumatic diathesis are specially liable. General malnutrition, neurasthenia, and debility, from whatever cause, are amongst the commonest conditions predisposing to neuralgia. Secondly, as to exciting causes—fatigue, physical or mental, is liable to induce an attack of neuralgia, so also may emotional shock in a predisposed individual. Amongst the diseases which are particularly associated with neuralgia as a sequela I may mention influenza and other fevers, also anæmia of any variety. Neuralgia may also occur in alcoholism, chronic malaria, diabetes, and gout, but in such toxic conditions the pain may be symptomatic of an early neuritis. In syphilitic patients neuralgia is sometimes symptomatic of gummatous infiltration around a nerve-trunk, whilst in other cases syphilitic neuralgia occurs in the early weeks or months after the infection, unaccompanied by other signs of gummatous deposit. A very frequent exciting cause of neuralgia is local exposure to cold and damp.

Lastly, there are the reflex causes of neuralgia. In trigeminal neuralgia in particular we should carefully search for local abnormalities in the territory of the nerve, investigating not only the teeth and gums, but also noting errors of refraction, glaucoma, or iritis, and diseases of the nose or its accessory sinuses. Brachial neuralgia may be excited by the pressure of deep-seated tumours or by a cervical rib, but in such cases the condition ultimately progresses to an organic neuritis of the nerve-roots, evidenced by muscular weakness and perhaps by blunting of sensibility. Then there are the whole series of “reflected” pains from visceral diseases, as in the shoulder-pain of hepatic disease, the arm-pain of angina pectoris and other cardiac affections, the abdominal pain of gastro-intestinal disease, the sacral pain (often spreading down the thigh) of dysmenorrhœa, the testicular pain of renal colic, the iliac pain of ovarian mischief, and so on.

*Symptoms.*—The essential symptom of neuralgia is pain limited to a particular nerve-area. It is generally unilateral or, if bilateral, it is asymmetrical. The occurrence of bilaterally symmetrical pain should always arouse the suspicion of a central organic disease. In most cases the neuralgic area remains the same in successive attacks; in others the site of the pain varies. The pain of neuralgia is paroxysmal, lasting acutely for periods from a second or two up to many minutes. It starts acutely at one spot and usually spreads in a definite direction over the whole nerve-area, generally downwards, less commonly centripetally. The patient may describe the pain as burning, tearing, stabbing, shooting, boring, etc. It may be superficial or deep. At the height of a paroxysm the pain may radiate into adjacent nerve-areas and the patient in desperation grasps the painful part or rubs it violently, especially in cases of trigeminal neuralgia. In neuralgia of the supra-orbital division I have seen the eyebrow almost completely worn away by repeated rubbing. In the intervals between the paroxysms pain may be altogether absent; more commonly there is a continuous dull, aching sensation in the affected area. The paroxysms of pain may recur spontaneously, or they may be excited by local stimuli, such as chewing, sneezing, or coughing (in the case of the trigeminal), or by light pressure on the skin. Some cases tend to have a regular periodicity, especially in the morning neuralgia of chronic malaria and in cases occurring at the menstrual periods. More often, however, the intervals are variable; some cases have numerous attacks daily, others go for weeks or months and then have a batch of paroxysms within a few days.

Another important characteristic of neuralgia is the presence of special "*tender spots*," exquisitely sensitive to light pressure, these spots being also the sites of maximum spontaneous pain. They are usually about the diameter of a finger-tip, and are situated along the course of the nerve (according to Valleix's original dictum), as follows:—where the nerve emerges through a bony foramen, where it crosses a rigid structure such as bone or fascia, where it divides into its terminal branches, and where it pierces the deep fascia to become subcutaneous. Occasionally we find tenderness over the spinous process corresponding



to the posterior nerve-root affected—Trousseau's "*point apophysaire*." These tender spots, although valuable as corroborative evidence of neuralgia, are by no means constantly present. In other cases, again, the whole nerve-trunk may be tender.

Vasomotor changes, in the form of local pallor followed by flushing, occasionally accompany the painful paroxysms, chiefly in trigeminal cases. Erythromelalgia is a variety of neuralgia associated with pain, redness, and even cyanosis of the foot, aggravated by a dependent position of the limb. During a paroxysm of neuralgia in any nerve-area the pulse may be temporarily slowed. Secretory phenomena occasionally accompany an attack, as, for example, lacrymation or salivation on the affected side in trigeminal cases. Temporary polyuria or excessive sweating may also accompany a paroxysm. In long-standing cases trophic changes may supervene; thus in trigeminal neuralgia the hair may turn grey or fall out at the sites of maximum pain. Temporary local œdema may coincide with a paroxysm; glossy skin and atrophic changes in the nails sometimes occur, notably in erythromelalgia, but marked trophic phenomena usually indicate an underlying neuritis.

*Diagnosis.*—In most instances this is not difficult, the paroxysmal pain, its remittent or intermittent character, its limitation to a nerve-area, the presence of tender spots, and the absence of signs of organic neuritis, all being highly suggestive. In every case, however, before diagnosing a case as idiopathic neuralgia, we should carefully exclude structural disease, since symptomatic neuralgic pains accompany many organic conditions, as in the "lightning-pains" of tabes, the root-pains of meningo-myelitis, of spinal tumours, and of herpes zoster, the cramp-like pains of dysbasia angio-sclerotica, the pains of aortic aneurisms, etc. Hysterical patients sometimes complain of intense pain, but this is rarely confined to a single nerve-area, and tends to become widely diffused.

*Prognosis.*—The longer the duration of the affection and the older the patient, the more difficult is the cure, except in syphilitic and malarial cases where the pain rapidly disappears under appropriate medication. Individual attacks of neuralgia are usually subdued *secundum artem*, but the condition tends to recur, especially if the sufferer be past middle age. The prognosis is still worse if there be an underlying neuritis.

*Trigeminal Neuralgia and Tic Douloureux.*—The face is one

of the commonest situations for neuralgia. The most severe of all neuralgias—*tic douloureux*—occurs in the trigeminal area. A single division of the nerve may be affected, or two adjacent divisions; all three divisions of the trigeminal are hardly ever affected at once. The supra-orbital division is more often attacked than the two lower divisions.

*Causes.*—In every case we should first seek for local causes at any point from the central origin of the nerve down to its terminations in the eye, nose, ear, or mouth. It is unnecessary to enumerate all the reflex causes which may induce trigeminal neuralgic pain. Not only may dental caries or periostitis cause pain in the whole of the corresponding division of the nerve, but edentulous subjects may also have neuralgia. This has been variously explained, sometimes as the result of dense bone filling up the empty alveoli and compressing the nerves there, whilst other cases appear to depend on changes in the temporo-maxillary joint and may be relieved by a well-fitting artificial denture.

*Symptoms.*—The pain, as already mentioned, is generally located to a single division, or to two adjacent divisions, of the nerve. Its onset is sudden, and when a paroxysm occurs the patient presses or rubs violently the affected part, avoiding meanwhile all voluntary movement of the face or jaw, although in severe cases a reflex involuntary spasm of the facial muscles occurs on the affected side—hence the name of “*tic douloureux*.” During the climax of the attack there is usually lachrymation, and sometimes excessive secretion of nasal mucus, of saliva, and of sweat, all on the affected side; the skin may turn pale and then become flushed. In long-standing cases the hair of the scalp or beard may turn grey or fall out. In some cases washing the face, shaving, chewing, sneezing, etc. may all serve to induce a paroxysm. The chief tender spots are at the bony foramina through which the branches emerge—the supra-orbital, infra-orbital, and mental foramina—also towards the posterior end of the zygoma where the auriculo-temporal branch ascends in front of the ear.

*Prognosis.*—Minor cases and those due to reflex causes are easily cured by removal of the exciting cause, and by the administration of an analgesic drug. True epileptiform neuralgia, on the other hand, is a most inveterate malady, which, if unrelieved, drives the patient to one of two alternatives,

morphia or suicide. I have seen more than one such case of attempted suicidal cut-throat from this cause.

*Cervico-Occipital Neuralgia.*—Unlike most other neuralgias, this is commonly bilateral. It affects the back of the head and neck, in the territory of the great and small occipital nerves and that of the four upper cervical nerves. The tender spots, on each side, are midway between the mastoid process and the vertebral column. In every case, we should be careful to exclude disease of the vertebræ or of the cervical meninges.

*Brachial Neuralgia.*—This affects the whole territory of the brachial plexus. Many cases follow traumatism, especially fractures and dislocations in the region of the shoulder. The whole limb may be affected by the pain, but special nerve-areas tend to be picked out for severe pain, *e.g.*, the ulnar with its tender spot behind the internal condyle, the median with tenderness along the inner side of the upper arm, and the musculo-spiral with its tender spot in the groove below the insertion of the deltoid. The occurrence of muscular atrophy or of anæsthesia of nerve distribution would point to an organic neuritis. A certain number of cases, however, are of hysterical origin, the exciting cause being some insignificant injury. Only a few weeks ago I saw a young man who complained of pain and tingling in the radial three-and-a-half digits of one hand, front and back, and of weakness of grasp, following a hypodermic injection in the region of the elbow. On examination there was a typical hysterical "sleeve" of cutaneous blunting to light touches, together with diffuse paresis of the whole limb without muscular wasting or alteration in reflexes. Moreover, the site of the injection was in front of the internal condyle and at some distance from any of the nerve trunks. True brachial neuralgia is usually aggravated by movement of the limb, which feels numb and heavy but is not actually paralysed.

*Intercostal Neuralgia.*—This variety is commoner in women than in men, and is more frequent on the left side. It generally affects several adjacent nerve-areas. The pain tends to be remittent rather than intermittent. The skin is often hyperæsthetic, and the tender spots are at the points of emergence of the perforating branches of the nerve, *viz.*, close to the spinous process, in the mid-axillary line, and near the middle line in front. Intercostal neuralgia may precede or



follow an attack of herpes zoster, and may persist as an obstinate malady long after the herpetic eruption has passed away. The occurrence of herpes, of course, indicates an organic neuritis of the corresponding posterior-root ganglion. Before diagnosing intercostal neuralgia we must be careful to exclude organic maladies, such as pleural disease, aneurism, angina pectoris, muscular pleurodynia of rheumatic origin, affections of the spinal meninges, etc. Lastly, visceral disease within the thorax or abdomen may produce reflected pain and cutaneous hyperæsthesia in small areas of the trunk, corresponding to the spinal segments from which the affected viscus receives its innervation. Here, again, physical examination and a consideration of the other signs and symptoms should prevent errors in diagnosis.

*Mammary Neuralgia or Mastodynia.*—This is commonest in women about middle life, and is not unfrequently associated with a groundless fear of cancer. There is intense cutaneous hyperæsthesia over the whole breast, especially at the nipple, and there also occur paroxysms of acute pain, sometimes coinciding with the menstrual periods. During or after an attack in a few instances there may be a secretion of milky fluid. The tender spots are over the corresponding vertebral spines, from the second to the sixth thoracic. Careful local examination of the breast and the exclusion of organic disease are essential for accurate diagnosis. Some cases follow prolonged lactation.

*Lumbo-abdominal Neuralgia.*—This affects the lower half of the trunk, extending from the lumbar region round towards the front of the abdomen, analogous to an intercostal neuralgia, sometimes radiating into the groin and genitals or into the upper gluteal region. During a paroxysm there may be cramp-like spasm of the abdominal wall and even of the cremaster. The tender spots are over the vertebræ, at the middle of the iliac crest, at the linea semilunaris, the inguinal canal, and the scrotum or labium. In all cases we must be careful to eliminate diseases of the kidney, the large intestine, and the pelvic organs. The occurrence of vomiting in addition to pain would suggest a visceral origin for the pain. Spinal neuralgia—so-called “irritable spine”—is one of the commonest phenomena in hysteria and neurasthenia, especially in cases following railway accidents. It is often the basis of litigation. The

condition is recognised by the intense cutaneous hyperæsthesia, together with the history of the case, and the absence of signs of disease of the vertebræ or spinal cord.

*Neuralgia Paræsthetica.*—This is a neuralgia of the outer aspect of the thigh in the area of the external cutaneous nerve. The pain is sometimes induced by standing or walking, perhaps owing to the stretching of the fascia lata. A number of cases are associated with flat-foot on the side of the pain. Between the attacks we may find a slight degree of cutaneous anæsthesia, indicating a neuritis.

*Sciatica.*—Of all varieties of neuralgia sciatica is the most frequent, just as tic douloureux is the most severe. In every case of so-called “sciatica” we should endeavour to decide whether we have to do with a pure neuralgia or with a neuritis.

In children sciatica is unknown. It is usually met with in middle-aged patients, in males oftener than females, and especially in individuals of a gouty diathesis. Some cases seem to follow gouty or rheumatic inflammation of the muscles and fasciæ of the lumbo-sacral region. Sciatica sometimes occurs in diabetic patients, in whom it tends to be bilateral. Certain local exciting causes are well recognised, such as cold and damp, as from sitting on grass, direct traumatism to the nerve, its compression within the pelvis by tumours, abscesses, or even by scybalous masses, or pressure by a pregnant uterus.

The essential symptom of sciatica is pain, which may be continuous or paroxysmal. When continuous, the pain is usually in the upper part of the nerve in the region of the sciatic foramen or upper third of the thigh. It is aggravated by movement of the limb or by sitting on the edge of a hard seat. To relax the nerve, the patient often keeps the knee and hip slightly flexed and a mild degree of lumbar scoliosis may develop. When the patient sits he rests his pelvis on the ischial tuberosity of the opposite side, so as to avoid pressure on the affected nerve. The chief tender spots are at the posterior inferior iliac spine, at the sciatic notch, in the popliteal space, below the head of the fibula, and behind the external malleolus. In addition to the constant dull pain, there are paroxysms of more violent suffering, radiating along the course of the nerve, commonly in a centripetal direction. Any movement of the limb which puts the nerve on the

stretch tends to induce a paroxysm. Blunting of cutaneous sensibility in small islands is not uncommon, such islands corresponding to the painful spots. Larger areas of anæsthesia, muscular wasting or fibrillary tremors, diminution or loss of the ankle-jerk, and changes in the electrical reactions, all these signs would point to a structural neuritis rather than a mere neuralgia. In neuritis the temperature of the limb is often lowered.

*Testicular Neuralgia.*—This variety, though not frequent, is associated with so much mental depression that it merits special mention. Paroxysmal pain occurs in the testicle or spermatic cord, sometimes associated with cutaneous hyperæsthesia of the scrotum and with tenderness on light pressure on the testicle. During a paroxysm the testicle may be drawn up. The condition is usually unilateral. A certain proportion of cases are associated with varicocele, and the pain subsides when this is treated. Other cases are part of the syndrome of renal colic, the pain of which affection often radiates into the testicle. I have seen cases of renal calculus where the pain was confined to the iliac fossa and testicle without extending up to the lumbar region.

*Coccygodynia.* — This variety is practically confined to women. The pain may occur when the patient sits or walks, or when the coccyx is otherwise moved, as during defæcation, or the paroxysms may appear spontaneously. Hysterical patients are specially liable to this form of neuralgia. Disease in the coccyx or its neighbourhood should be carefully excluded by local examination before arriving at a diagnosis of neuralgia. The painful paroxysm can generally be allayed by a morphia suppository, by local faradisation, or, in hysterical patients, by suggestion.

*Treatment of Neuralgia.*—In every case our first duty is to decide whether we are dealing with a pure neuralgia or with a neuralgia caused by an underlying neuritis or other organic condition. We should search for, and if possible remove, all sources of peripheral irritation, *e.g.*, errors of refraction, decayed teeth, varicocele, etc. In every instance, whatever be the cause, we have to relieve the patient's pain. In individuals who are the subjects of neurasthenia, of hysteria, or of malnutrition, cure may be indefinitely delayed until the primary underlying cause is treated by diet, tonic treatment, psychical



suggestion, and if necessary by a course of massage, electricity, and complete change of environment. The subjects of severe cases are undoubtedly best removed from their own homes to a hospital or nursing-home.

Cases of recent onset, especially in patients with a rheumatic or gouty diathesis, often yield promptly to a course of hot baths, local radiant heat, mud-baths, or other diaphoretic measures. In cases of recent onset of moderate severity the pain is generally relieved by a small fly-blister applied at the tender spot, or by touching such spot with a Pacquelin cautery. In rheumatic patients a 10-grain dose of salicyl-acetic acid is useful. The list of analgesic drugs is endless, and we need only refer to some of the best known of the coal-tar group, such as phenazonum, acetanilide, and pyramidon. A mixture containing—

|                 |   |   |   |        |
|-----------------|---|---|---|--------|
| Phenazonum -    | - | - | - | gr. x. |
| Sod. Bromide -  | - | - | - | gr. x. |
| Caffein Citrate | - | - | - | gr. v. |
| Elixir Cocæ to  | - | - | - | ʒii.   |

taken in a wineglassful of water at the onset of a paroxysm, often succeeds in cutting it short.

Sometimes an attack can be relieved by a constant current of from 15 to 20 milliampères, the positive pole being applied to the painful area for about 20 minutes at a time, care being taken not to turn on the full strength of current at once or to use a current severe enough to cause discomfort. Or the galvanic current may be employed to carry in analgesic drugs by katephoresis or electrical osmosis, whereby an electrolytic substance is split up into its opposing "ions," positive and negative, one of which is driven through the unbroken skin and absorbed into the tissues. Thus, if the negative pole of a galvanic circuit be moistened with a solution of iodide of potassium or of salicylate of soda, the positive ions ("an-ions") of iodine or of salicylic acid respectively, are carried in. On the other hand, alkaloids, such as quinine, cocaine, morphine, or aconitine, act as negative ions (kat-ions) and have to be applied through the positive pole.

In more severe cases, as in tic douloureux, ordinary drug treatment may fail, and it may become necessary to administer morphia hypodermically. This, of course, will relieve the pain for a time, but with succeeding paroxysms, progressively larger doses are required, and there is a grave risk of the patient

becoming a morphine *habitué*. Needless to say, hypodermic administration of morphia by the patient himself should never be sanctioned.

Subcutaneous injections of air, especially in intercostal neuralgia, have been highly recommended by Desplats and other Continental observers, from quarter to half a litre being injected at a time. I myself have no personal experience of the method.

The two most obstinate forms of neuralgia are undoubtedly sciatica and tic douloureux. In severe and chronic cases of sciatica, if the above-mentioned remedies fail, we must proceed to more drastic measures. Many cases are markedly relieved by absolute rest in bed for two or three weeks, with a long splint to the lower limb and extension to the foot, combining this with the application of a Pacquelin cautery to the tender spots on alternate days. Injections of solutions containing eucaine, stovaine, adrenalin, etc., either in alcoholic or, more dilute, in saline solution, have also been employed, such injections being introduced either into or around the nerve-trunk. By such means a number of cases have been freed from pain, but inasmuch as the sciatic is a mixed nerve, there is a risk of producing motor palsy, especially in the territory of the external popliteal nerve, which palsy lasts for weeks or months, as in a case which I observed not long ago. In cases with evidence of organic sciatic neuritis, relief is sometimes obtained by cutting down on the nerve, freeing it from adhesions, and forcibly stretching the nerve-trunk.

In the agonising pain of tic douloureux, nerve-stretching and nerve excision afford temporary relief for a few weeks or months. The pain then recurs and permanent results are only obtained by excision of the Gasserian ganglion. This operation, however, is a most formidable one, with a considerable mortality even in skilled hands. Moreover, when successful, it necessarily produces not only disfigurement but also total trigeminal palsy, with anæsthesia of the skin and mucous membranes of the corresponding side of the face, and with unilateral palsy of the muscles of mastication. All these are drawbacks, yet many patients willingly submit to them, in order to be free from pain.

Within the last couple of years an alternative to "Gasserectomy" has been introduced by Schlösser of Munich, who has

shown that the pain can be relieved by deep injections of 75 per cent. alcohol into the affected divisions of the trigeminal nerve at their foramina of exit from the base of the skull, close to their emergence from the Gasserian ganglion. The first division is injected through the orbit at the sphenoidal fissure, the second and third divisions are approached through the cheek, just below the zygoma, the needle being passed towards the foramen rotundum and foramen ovale respectively. I have elsewhere,<sup>1</sup> given details of the method of puncture, based on the excellent article by Levy and Baudouin.<sup>2</sup> The results of this treatment in my hands have been highly satisfactory, the overwhelming majority of cases having been completely relieved from pain. Schlösser's statistics of 123 cases give an average period of relief of over 10 months, and sometimes much longer; the injections can then be repeated, each relapse being milder and the intervals of freedom from pain becoming longer. Kiliani<sup>3</sup> records a series of 55 cases with 52 cures. The solution which I at present employ consists of 75 per cent alcohol, containing gr. 2 of eucaine to the ounce. With a knowledge of anatomy, and a little dexterity, the injections can be performed with comparative ease. I myself do such injections in the out-patient room. The pain of the skin-puncture is prevented by local freezing with ethylchloride. When the end of the needle reaches the nerve-trunk, a transient twinge of pain is produced, but this is not severe, and is of some value in indicating that the needle has reached the foramen. In cases of injections into the orbit, or in highly sensitive patients, the injection can be done under general anæsthesia with nitrous oxide. After a successful puncture there may be temporary blunting of sensation in the affected division of the nerve for a few days. This, however, clears up, and there is no permanent paralysis, sensory or motor. This method of treatment is free from the grave risks and sequelæ of Gasserectomy. A single injection is often enough to stop the paroxysms. Any lingering pain is usually relieved by a second injection a few days later. More obstinate cases have required three, four, or even five injections before the cure is complete.

<sup>1</sup> *Medical Annual*, 1909, p. 579; *Clinical Journal*, March 17, 1909.

<sup>2</sup> *La Presse Médicale*, Feb. 17, 1906.

<sup>3</sup> *Medical Record*, Jan. 18, 1908.



## PERTUSSIS OR HOOPING-COUGH.

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IN "As you like it" Celia exclaims, "O wonderful, wonderful, and most wonderful wonderful ! and yet again wonderful, and after that out of all hooping." The quotation may serve to explain the absence of the usual initial "W," which is an excrescence added in the last century to the original name. This it is probable was derived directly from the French authors who were the first in the sixteenth century to describe the disease under the name of "*le toux qui houe*," the cough which cries aloud.

In England its popular name, still in use in some parts of the country, is the chin-cough, a corruption of the original "chink-cough." This popular name is reproduced in the Scotch "kink-hoost," and the Dutch and Danish equivalents. "Chink" or "kink" in early English means a catch in the breath, and is closely associated with the word to choke, both having the same ultimate derivation.

Like some of the other infective diseases, hooping-cough is not noticed in the earlier works on medicine, and it remained undescribed in this country until Sydenham, towards the close of the 17th century, gave it the name *Pertussis Infantum*, by which it is still known to medicine. That a disease of such marked and peculiar characteristics could have escaped the acute observation of the earlier writers on medicine seems almost inconceivable, and it is known that at the time when its features were first described it prevailed in devastating epidemics in France and the Continent generally, and was believed to have spread to England from the Continent. It seems, therefore, permissible to infer that at that period it was a new disease, but whence it was derived, or exactly where it first made its appearance, is quite unknown.

Pertussis is a contagious infective disorder, the principal

symptoms of which are concerned with the respiratory tract. Trousseau, in his classical lecture on the subject, called it a specific pulmonary catarrh, but there is good reason, from its general characters, its onset with fever, its slow development, and its complications, many of which are best explained by the assumption of the presence of toxins, to class it rather as a general, than as a local, infection. Its characteristic symptom is, of course, the convulsive paroxysmal cough, which seizes the patient at more or less prolonged intervals, each paroxysm terminating in a long-drawn inspiration accompanied by a crowing sound.

As a general rule the transmission of pertussis from the affected to healthy individuals is direct, occurring in most instances through the sputum showered round the patient by the act of coughing; but occasionally infection takes place indirectly, conveyed by the clothes of a third person, or through the medium of books, toys, or handkerchiefs. If precautions are taken, however, to minimise the distribution of the sputum and to disinfect the material actually coughed up the spread of the disease is not, as a rule, marked. Hence it is found that although in families and schools whooping-cough spreads with great rapidity, and attacks nearly all who are unprotected by a previous infection, in hospital wards it is not uncommon for the disease to be limited to the original case, no spread or the affection taking place, although many possible victims are being nursed at the same time.

The most contagious period of the disease is certainly the catarrhal stage, before the characteristic hoop is heard, and towards the end of the paroxysmal period there does not seem to be much danger. There are, however, cases recorded which would seem to point to infection as having occurred late in the disease, when the hoop is heard seldom or not at all.

Pertussis is essentially a disease of children, though even extreme old age is not immune. In this country the greatest number of cases occur in the first two years of life, and after ten years of age the disease becomes comparatively rare. In London and other large towns it is endemic, but varies in its spread at different periods of the year. It is usually at its height in March or April, and diminishes gradually to its

lowest point in September. In foreign countries these periods differ slightly : for instance, in New York there would appear to be a period in November at which the disease is widely prevalent, followed by a period of remission in December and January, and a second period of increase in April. Apart from these seasonal variations, its epidemic character is best appreciated when it attacks a comparatively small community which has a large number of unprotected individuals.

In all countries female children seem to be more prone to acquire the disease than male, but the difference is not marked.

Protection is, as a rule, conferred by one attack, but there are a few cases on record which prove that this is not an invariable law. There are certain individuals who appear to possess a natural immunity, being often exposed to the infection without succumbing, but in old age this natural immunity seems occasionally to disappear, and men and women advanced in years, who never previously had the disease, fall an easy prey to it.

An interesting point in regard to immunity is that enjoyed by suckling infants. It has been suggested that a mother who has acquired immunity through an attack is able to furnish her suckling infant with protective substances in her milk. In cases where the mother is at the time of the birth suffering from the complaint the infants almost invariably acquire the disease, and an instance is recorded where the characteristic hoop was heard on the first day of life.

Hooping-cough is almost certainly due to the invasion of a micro-organism, as to the characters of which there is as yet no certain knowledge. Many observers have isolated bacteria from the sputum, the trachea, and the lungs of affected persons, and have occasionally been able to produce some of the symptoms of the disease in animals. The organism which has the fairest credentials at present is a short rod with many of the characteristics of the bacillus of influenza, differing from it in its cultural habits. An organism of this type has been isolated by several good observers, and though there is no general agreement as to its precise relation to the disease it is probable that one or other of these influenza-like bacilli is the true cause of pertussis, and it is possible that the



variations in its behaviour which have puzzled bacteriologists can be explained as easily as, for example, the variations in the behaviour of different strains of the *Bacillus coli communis*.

*Incubation.*—Since the first symptoms of whooping-cough are not characteristic of the disease, it is difficult to estimate the duration of the period of incubation. In a few instances, however, where the onset has been sudden and marked, and the date of exposure to the contagion accurately known, it has been found that the usual period is about a week. It may be as little as three days, and it may be occasionally as long as a fortnight. If after exposure to the infection there is no sign of the disease at the end of three weeks, it is safe to assume that infection has not occurred.

During the period of incubation the only symptoms of lack of health that have been observed are lassitude, headache, and disturbed sleep—in fact, nothing in the least calculated to rouse suspicion.

*Invasion.*—This stage is marked by the onset of fever, usually slight, but occasionally of considerable severity, and by a general catarrh of the respiratory passages, accompanied by a cough which gradually becomes more paroxysmal in character until, after the expiration of a week or ten days, the characteristic hoop is heard. During this catarrhal stage the cough is, as a rule, out of all proportions to the amount of catarrh revealed by auscultation, a point on which some clinicians weigh as being of service in early diagnosis. Trousseau lays down the rule that while the fever of a simple catarrh is of short duration, two to three days only, that of pertussis lasts a week or longer; but this is certainly misleading, for in a considerable proportion of cases fever is absent after the first day or two. As a general rule, the only character during the catarrhal stage which is peculiar is the convulsive cough, of greater intensity and frequency at night than in the daytime, and provoked by any emotional or physical disturbance.

*Paroxysmal Stage.*—With the appearance of the characteristic “hoop” the paroxysmal stage of the disease begins, and in cases of moderate severity the frequency and intensity of the paroxysms increase to an acme and then gradually

decline until at the expiration of from two to three weeks the hoop becomes rare, and though occasionally heard in the succeeding fortnight, the period of decline, finally disappears at about the eighth week from the onset of the illness.

The typical paroxysm of whooping-cough is so familiar as to need little description, and the terminal hoop once heard is not easily forgotten. The paroxysm occurs spontaneously or it may be excited by a variety of circumstances; laughing, crying, sneezing, the eating of dry biscuits, or the drinking of cold water are all apparently able to start a paroxysm, but the most frequent attacks take place during sleep, without an obvious exciting cause. Children old enough to analyse their symptoms describe the paroxysm as heralded by a sensation of choking, by pain under the sternum, or by a sudden malaise. These premonitory symptoms are followed immediately by a series of violent expiratory efforts so closely succeeding one another that there is no possibility of inspiration. The face and mucous membranes become cyanosed, the eyes bulge, the conjunctivæ become bloodshot, and the tongue is protruded, until at last the exhaustion of the expiratory muscles permits of a relaxation, and the muscles of inspiration coming into play draw air into the chest with a long-drawn crowing sound. The paroxysm may be renewed again and again until finally a small pellet of viscid mucus is expectorated and the attack is at an end. Vomiting often takes place with the termination of the paroxysm, and in the early stages, and also in the period of decline, may replace the hoop. In some instances it has been noted that instead of a hoop the paroxysm terminates with violent sneezing. The duration of an attack is seldom more than two or three minutes, though often exaggerated by parents and nurses. In strong healthy children, whose paroxysms are of moderate severity, the intervals between the attacks find them in complete comfort; when the attack is over they resume their interrupted games without any apparent ill-effects. Weakly children, however, and those in whom the attacks are unusually severe, suffer considerably in their general health. They sweat profusely, breathe with considerable difficulty, their pulses become intermittent, and in some cases they fall into an alarming condition

resembling a syncopal attack.

The number of the paroxysmal attacks varies considerably. In strong healthy children where there are no complications the number even at the height of the disease does not exceed 10 or 15 in the course of the 24 hours, while in the case of weakly children, and in the event of the graver respiratory complications, there may be from 40 to 50 attacks in the same time. Trousseau lays down as an axiom that more than 40 attacks render the prognosis grave, and that the issue of the disease where there are more than 60 paroxysms is invariably fatal, but, like all dogmatic statements, this can be challenged.

*Stage of Decline.*—The paroxysms, after reaching their greatest number in the third or fourth week of the disease, gradually decline in frequency until they recur only once or twice in the day, and finally disappear. During this period the health of the patient is rapidly re-established, and in the absence of complications complete recovery is attained at about the end of the sixth or eighth week. In some patients, however, the characteristic cough persists for some weeks or months, recurring at rare intervals, and excited by emotion, or by the incidence of a common cold.

*Symptoms attending the Paroxysmal Stage.*—Besides the characteristic cough there are present, especially in the paroxysmal stage of the disease, a number of symptoms which serve as valuable aids to diagnosis when the cough is not heard. The persistent congestion of the veins of the face and the cyanosis of the lips and mucous membranes, together with the œdema of the loose tissues of the eyelids, combine to produce a facial appearance which is almost pathognomonic of the disease, and if to this is added subconjunctival hæmorrhage in one or both eyes, the diagnosis cannot be in doubt. Another valuable sign when present is the sublingual ulcer. During the act of coughing the protruded tongue is rubbed violently over the lower incisor teeth, and thereby a small ulcerated patch is, especially in weakly children, produced on the frænum linguæ. So far as my own experience goes such an ulcer is never met with except in whooping-cough, and though it occurs in a comparatively small percentage of the patients, when it is present it is an absolutely certain diagnostic sign.



Another sign, frequently observed, is the alteration in the shape of the chest, due to the occurrence of emphysema of the lungs. The chest is rounded, the intercostal spaces are full, and the inspiratory expansion is much diminished in extent. In all cases there is probably a certain degree of emphysema, but, as a rule, this alteration of the shape of the chest is observed only in severe and protracted cases of the disease. When convalescence is established the emphysema, as a general rule, disappears within a few weeks, and the chest assumes more natural dimensions and movements.

With the occurrence of the persistent congestion and the establishment of emphysema, the circulation in the lungs becomes impeded, and an undue amount of work is thrown upon the right ventricle of the heart. In most cases of moderate severity, therefore, it is usual to find some dilatation to the right side and an exaggeration of the sharpness and clearness of the pulmonary second sound.

Hooping-cough at the onset excites in the circulating blood a leucocytosis of a peculiar character—an increase in the number of the lymphocytes. A large number of observations have now been made, and it is agreed that in the first few weeks of the disease, even before the hoop is heard, this characteristic change can be observed in the majority of cases; usually the leucocytosis is of moderate degree, but, whether mild or severe, it invariably presents the peculiar characteristic that the greatest proportionate increase is in the number of the lymphocytes. It is claimed that this lymphocytosis is present even in the catarrhal stage, and is, therefore, of considerable value as a means of diagnosis; and further, that since its severity varies with the severity of the disease, it is a help to prognosis. The second claim is more dubious than the first, but the occasions when this means of diagnosis is of importance are infrequent.

*Variations from the Normal Course.*—The comparative immunity of infants at the breast has already been noted. A further peculiarity in them is that they not infrequently suffer from pertussis sine pertussi, or, in other words, the “hoop” is absent. It is replaced by a condition of apnœa, or in some instances by a syncope. Such hooping-cough without a hoop occurs also in older children and in adults, but can, of course,

only be diagnosed in the presence of an epidemic.

Trousseau has recorded cases in which the duration of the disease has been limited to two or three weeks, instead of lasting, as is usual, six to eight weeks, but such a phenomenon is so infrequent as to justify considerable doubt as to the accuracy of the observation.

*Complications.*—Pertussis without complication is a disease of little moment, distressing to the patient, annoying to parents and schoolmasters, but of small importance either in its immediate or remote effects. The complications, however, which it often induces are of such gravity that the disease actually stands very high among the causes of death in children.

*Broncho-pneumonia.*—The most serious, as it is the most frequent, of these complications is the occurrence of capillary bronchitis and of broncho-pneumonia. In infants the catarrhal condition which marks the onset of the disease frequently passes to a capillary bronchitis, with its attendant collapse and subsequent consolidation before the onset of the paroxysmal stage, and the true underlying cause of the respiratory symptoms may be betrayed only comparatively late in the disease, when the consolidation is passing off, and the general condition improving. But there can be, I think, no doubt that a good many infants die from this broncho-pneumonic consolidation without the diagnosis of pertussis being made—in fact, without the possibility of its being made.

In older children, and in many infants, the onset of broncho-pneumonia is delayed until the paroxysmal stage of the disease is fully established. The sudden disappearance of the hoop, the rise of temperature, or the occurrence of a convulsion indicates the graver aspect of the case. The course of broncho-pneumonia in pertussis presents nothing characteristic; its bad prognosis is due to the fact that it attacks the patient in a period of lowered vitality, and is apt to be unduly prolonged.

*Empyema.*—The broncho-pneumonia of hooping-cough, unlike that of measles, is seldom followed by empyema; indeed, in cases seen at necropsy pleurisy of any great extent is seldom seen.

*Emphysema.*—In all cases of a moderate degree of severity vesicular emphysema is probably present, and in some of these there may be interlobular and interstitial emphysema, but

the permanent changes so often seen in the lungs of adults affected with chronic bronchitis, *i.e.*, hypertrophic emphysema, is a very rare sequel to hooping-cough.

*Bronchiectasis.*—A more common and much more dangerous sequel of the broncho-pneumonia of pertussis, because its development is insidious, is bronchiectasis. It is probable that in any severe and prolonged broncho-pneumonia there is a certain degree of weakening and dilatation of the bronchial tubes, but in the case of pertussis there is the additional factor of the unusual severity and persistence of the cough. It is difficult to estimate the frequency of this most serious complication, because the majority of cases of the condition are first recognised some time after the occurrence of the attack of pertussis, and there is often a period of comparative health intervening between the attack of hooping-cough and the onset of the symptoms which lead to the diagnosis of the bronchiectasis, but my own impression is that not a few cases of bronchiectasis owe their origin to an attack of pertussis, perhaps almost forgotten, in which the broncho-pneumonic consolidation has never quite disappeared, and the dilatation of the bronchi, in most cases a temporary phenomenon, has become permanent. Another point in this connection, which I find also extremely obscure, is the possibility of recovery from this condition. From observation of a considerable number of such cases I believe it to be true that the majority progress slowly in the downward direction, each ensuing attack of inflammation in and around the affected bronchi leaving a little less healthy lung than before, until the greater part of the affected lung is reduced to a fibrous, airless condition, with pockets of purulent matter occupying spaces which once were bronchial tubes. On the other hand, I have seen at least two instances where a child, who at one time presented both the signs and the symptoms of a limited bronchiectasis, has apparently completely recovered.

*Tuberculosis.*—It is a commonplace of medicine that pertussis is a frequent precursor of tuberculosis, either of the bronchial glands, or of a disseminated miliary tuberculosis, and the fact that in fatal cases of hooping-cough these conditions are frequently found at necropsy is well established. My own experience would lead me to express the facts with a



different explanation. If in a fatal case of pertussis associated with tuberculosis one studies carefully the apparent age of the tuberculous lesions, and compares them with the date of onset of the hooping-cough, it becomes evident that the tuberculous infection has in the majority of instances preceded the hooping-cough, and that it is the latter which has given the tubercle bacillus its opportunity of dissemination. The importance of this interpretation, if it be correct, lies in this, that if we are able to reduce the incidence of tuberculosis upon the infant population we shall at the same time reduce largely the mortality from hooping-cough. The diagnosis of tuberculosis in the course of an attack of pertussis, or following it, is extremely difficult. The known frequency of the association of the two diseases probably leads to its diagnosis somewhat more often than is correct. The accepted signs of tuberculous infiltration of the bronchial glands—the loss of percussion tone in the interseapular region, the persistence of rapid breathing, and the general failure of health—can all be caused by a non-tuberculous lobular pneumonia; and at present there is no sufficient agreement as to the value in such cases of Calmette's or Von Pirquet's reactions. In older children I have several times seen the diagnosis of generalised tuberculosis made with considerable certainty when the child has shortly afterwards rapidly improved and eventually gone to complete recovery. So frequently is this the case that in children of four and five years of age who present the appearances and signs of acute miliary tuberculosis I always enquire carefully as to hooping-cough, and if there has been a recent attack of that disease, I give a prognosis which is more often than not justified by the event. It is of course possible that in these cases there is in reality tuberculosis which goes on to recovery, but on the other hand the ascertained recoveries from acute miliary tuberculosis are extremely rare, and I believe that the real condition is a protracted and severe lobular pneumonia. In other cases there may exist for weeks, or even months, a well-defined consolidation of the apex of one lung, with moist and crepitant râles and bronchial breathing: this is almost always interpreted as the result of tuberculous infiltration of the lung, and yet after a protracted duration may

resolve in the course of a few days, and leave no trace behind. In such an event it is difficult to believe that the lesion has been tuberculous.

*Hæmorrhages.*—The hæmorrhagic complications of pertussis are for the most part of slight importance. The sub-conjunctival hæmorrhages, already mentioned, are useful aids to diagnosis, but otherwise have no importance. Much more rarely hæmorrhage occurs inside the eye, and may lead to permanent blindness.

Hæmoptysis of slight extent is common, and is probably in the majority of cases not due to bleeding from the lungs so much as to rupture of capillaries in the pharynx and larynx. Hæmoptysis to considerable amount is rare, and is always to be attributed to a grave complication.

Epistaxis is common, and may, by its frequent recurrence, lead to a severe grade of anæmia.

Hæmorrhages into the skin of the face are not uncommon but on the trunk and limbs they are rare; the cracked lips nearly always bleed slightly during a paroxysm, and blood may also come from the gums.

Hæmorrhage into the meninges of the brain and cord, or into the cerebral substance, is often invoked as an explanation of the nervous phenomena, paralyses and convulsions, which are observed in the course of, or following, an attack of pertussis; but such hæmorrhage is seldom found at the necropsy, and when it is found, as in a case I saw recently, there has often been no clinical phenomenon to suggest its occurrence.

*Complications in the Nervous System.*—These are uncommon events, but from time to time there are recorded examples of hemiplegia, of diplegia, of monoplegia, of eye-palsies, and of mental defects following attacks of pertussis. The pathology of such conditions is obscure, but they are generally ascribed to the toxins manufactured in the course of the disease, an ascription purely theoretical.

The other complications met with in whooping-cough include nephritis, acute otitis media, anæmia, protracted diarrhœa, and prolonged general ill-health. The connection of these with the attack of pertussis is probably incidental.

*Diagnosis.*—From what has been said it will be clear that

in the majority of cases the diagnosis of established whooping-cough presents no difficulties. There are, however, two conditions which closely simulate whooping-cough and may lead to its diagnosis when it is not present. The first is an enlargement, usually tuberculous, of the bronchial glands. The diagnosis must be made by observing that in this case there is not the progressive march of events normal to pertussis, that vomiting with the cough is rare, and that fever is usually present, often of a hectic type. The other condition is the presence of a foreign body in the trachea or bronchi. In this case the paroxysmal cough is usually of shorter duration, and interspersed with inspiratory efforts; the pulmonary signs are more commonly unilateral, and the general constitutional disturbance more pronounced.

The other difficulties of diagnosis have been already indicated: the difficulty in the catarrhal stage, in the case of suckling infants where there is no hoop, and where the onset of some severe complication has suppressed the hoop.

*Prognosis.*—Pertussis without complications is a trivial disease, except in young infants; with complications it is one of the graver disorders of childhood. Figures show a case mortality of 25 per cent. in the first year of life, and from 6 to 7 per cent. up to 10 years of age. After 10 years of age the mortality is nil.

Trousseau's deduction from the number of paroxysmal attacks has been already mentioned, and the other chief factors in making the prognosis are the frequency of the vomiting and the environment of the patient. Persistent vomiting may threaten life by destroying nutrition, and ill-ventilated rooms, overcrowding, and want of cleanliness and attention are obvious contributing causes of a fatal issue.

*Treatment.*—After several centuries of close study of the disease, the treatment remains purely empirical. Attempts have been made to devise a serum treatment, but until the true cause of the disease is known such attempts, with our present knowledge, are doomed to failure. At present the most successful treatment of the disease lies in securing to the patient the most hygienic surroundings and in caring for the symptoms as they arise. In young children special attention must be paid to nutrition, especially if, as is often the case,



vomiting is a prominent symptom. In many cases it is good practice to feed the patient in small quantities directly the act of vomiting is past, and in such cases the food must be soft and easily digested. Where the paroxysms are severe and frequent it is best to confine the patient to a liquid diet, but in ordinary forms of the disease this precaution is unnecessary.

Of drug treatment directed to the relief of the paroxysmal cough it is impossible to say much, for to do so would be to review the whole armamentarium of expectorants and antispasmodics. I propose to mention here only a few of those drugs which seem to have a real, though at best but a slight, efficacy. A combination of belladonna with one or other of the bromides seems to be most in favour, and in some cases undoubtedly produces a temporary amelioration; unfortunately the effect passes quickly, and a renewed administration often fails to produce the previous result. Nevertheless, in cases of any degree of severity, it is undoubtedly wise to persevere with the tincture or extract of belladonna, which may be given even to young children in far larger doses than the official ones without any ill-effects. Thus, to a child of 3 or 4 years, the full adult dose of 15 minims may be given three times a day, and even may be pushed beyond that, provided no symptoms of poisoning occur. Nor is the occurrence of broncho-pneumonia a contraindication; in the majority of cases of such a complication, belladonna is extremely useful, and I have seen children of 3 and 4 years of age take as much as a drachm of the tincture three times a day with apparent benefit. Bromoform is another drug which was at one time in much favour, but in my own experience it is disappointing, while other sedatives, such as morphia, codein, heroin, and choral, appear to me to have no value commensurate with their obvious defects.

Antipyrin is said by many authorities to diminish the number of the attacks, but this again is of little service in a case of real severity, nor can anything more be said in favour of tussol, pertussin, antispasmin, and the rest.

The best of the tonic, and possibly bactericidal, drugs to employ is quinine, which is unfortunately a drug which it is difficult to administer to children, who dislike it, as a rule, extremely. It may, however, be given in combination with

belladonna in the form of the compound tincture.

Other methods of treatment have been directed more immediately to the respiratory passage. Insufflations of various drugs, and inhalations, have been extensively used without much obvious effect. Lastly, the air of the sick-room has been impregnated with some more or less volatile disinfectant, but this measure, again, has not had a visible effect in diminishing the number or severity of the paroxysms, and the same may be said of the results of placing the patient in a pneumatic cabinet where the air-pressure can be diminished or increased at will.

From this brief review, it will be gathered that there is an open field for the trial of any therapeutic agent which may be offered as the result of the researches now progressing into the specificity of the bacillus which is by many believed to be the true cause of pertussis, but the writer reiterates his belief that the chief diminution in the mortality from whooping-cough is to be sought in the results of the campaign against tuberculosis.



## TREATMENT OF BRONCHITIS.

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IN discussing the question of the treatment of bronchitis it is necessary to consider briefly what is meant by the term, and to give a short account of the pathology of the condition. Bronchitis is the name applied to any inflammation which affects the bronchial mucous membrane. It is not sharply separated from a similar affection of the trachea and there is no common name for the condition in which the smaller tubes are the site of the lesion, though bronchiolitis, which is only an extension of the disease, is as a rule a much more serious illness. The term bronchitis should therefore only be applied to an inflammation of the larger tubes, *i.e.*, to those above the third or fourth order of division from the principal bronchial stems. In considering the pathology of the condition, it may be of service to recall a few points in the structure of these tubes. In the larger bronchi the cartilage forms an incomplete circle just as it does in the trachea, but as the tubes divide in the interior of the lung, a complete ring of cartilage is found. In the smaller branches the cartilage becomes broken up, so that instead of there being a complete ring there are several discrete portions which are firmly held together by fibrous tissue, and in the smallest divisions there is no cartilage at all. Muscular and elastic tissues are present throughout the whole system of tubes. Inside this ring of cartilage or muscle lies a vascular submucosa, and within this the mucous membrane which is covered with ciliated epithelium. In the larger tubes there are many mucous glands, but these diminish in numbers with the size of the tube. For practical purposes it may be said that the larger tubes, as regards the lumen, are non-dilatable but that they are subject to a narrowing either by muscular contraction or by swelling of the lining membrane. Further, any injury to the mucosa results in diminished or lost action of the cilia.

The direct cause of bronchitis in the majority of cases is



an infection by micro-organisms. Of these the commonest are the pneumococcus and its ally the streptococcus. These organisms are nearly always present in the buccal and tonsillar mucous membranes and they cannot be entirely eliminated, but their numbers can be kept in subjection. The bacillus influenzae and micrococcus catarrhalis are also not uncommon. Other organisms have been isolated, and it must not be forgotten that a severe attack of bronchitis may be one of the early signs of typhoid fever, measles, or whooping-cough. A secondary infection is not infrequently superimposed on the original one, especially if the condition lasts for some time. A septic bronchitis may develop from a simple attack lasting for some time, or may be due to the presence of a foreign body in the lung, or may result from infection from outside the bronchial wall, as in the case of perforation from a malignant growth in the œsophagus.

The histological changes which occur in bronchitis may be described shortly as follows. At the onset there is a condition of hyperæmia of the mucous membrane which leads to swelling and dryness of the surface and a secretion of viscid mucus. The swelling may lead to some actual narrowing of the lumen of the tube and give rise to the sensation of difficulty of breathing. The "rawness," which is constantly complained of, is due to the increased sensibility of the nerves of the inflamed membrane and is accentuated by the loss of function of the nasal mucous membrane (which is usually associated with this affection). Probably this sensation arises largely in the trachea. The sense of oppression which is complained of at the upper part of the sternum corresponds with the bronchial area of referred pain.

The early cough, which is dry and unproductive, is due to the stimulation of the nerves of the bronchial mucous membrane by the dilated vessels and their secretion, and to the toxins absorbed. The constant irritating cough and dyspnœa are very distressing, and are the cause of alarm to the patient and his friends. Frequently the temperature is raised to 102° F., and in severe cases there are cyanosis and some sweating. At the end of 48 hours or less the second stage supervenes. A decrease in the turgescence of the membrane follows, and secretion gradually becomes more free. The sense

of oppression diminishes, and the presternal pain is less complained of. The "rawness" of the air does not cause so much discomfort, and the general symptoms are relieved. There is decrease in the swelling of the lining mucous membrane, and secretion gradually becomes more free. It is usually mucopurulent and frothy, and gradually becomes more mucoid in character. The expectoration consists of mucus, leucocytes and desquamated cells from the bronchial tubes, together with a considerable amount of serum and the organisms which are causing the disease. This stage lasts from two to three days, or even longer, and is followed by a period in which there is a gradual recovery to the normal state. The cough is easy, and the expectoration which is more liquid gradually ceases. The latter consists of watery material containing thin mucus and leucocytes and fewer catarrhal and epithelial cells from the bronchi.

Such an attack of uncomplicated bronchitis in a healthy adult need cause but very little anxiety, and it may be said that severe cold passes through these stages in a mild degree. In the ordinary cold, however, the lesion generally does not extend far down the bronchial tree, and the individual has full possession of his recuperative powers. It is in the elderly or very young, or in those who have for some reason (generally owing to some collateral disease) a diminished power of resistance, that anxiety arises and great care is required. In such cases it is always better to err on the side of caution, and there is no doubt that the ordinary cold gets better more quickly if the patient is kept in bed than if he is allowed to be up and about, not to say out of doors. Bed should, therefore, be insisted on, and even in the mildest attacks, till the temperature has been normal for at least 48 hours. At the end of this time the patient may be allowed up for a further period of 48 hours, and then, weather permitting, two or three days at Folkestone, Hythe, Hastings, or some other suitable health resort, will generally see him through the attack. In the North, Blackpool, Lytham, or St. Anne's are warm and sheltered places even in winter.

When the attack is more severe, treatment should be carried out on the same general principles, but with more detail. The patient must be put to bed, and, if possible, proper nursing

arrangements should be made. It is unnecessary to make him sleep between blankets, but cotton sheets will be found to be preferable to linen. A tent may be arranged to protect that part of the bed where the patient's head and shoulders rest. A night-stool should also be provided in the room near the fire, and surrounded by screens, to obviate the necessity of crossing a passage to an ordinary watercloset. Much comfort may be derived from a hot bath for ten minutes before first going to bed. This should be given in a hip-bath, a thick towel being spread over the edges of the bath and fixed loosely round the patient's neck. It should be given in front of the fire, and in the same room which the patient is going to occupy, and be surrounded by screens or other device to keep off the draught. Much of the good effect is destroyed if the patient has to cross a cold passage, but if this is inevitable the head should be enveloped in the moist towel which has been employed to wipe him, and being well wrapped up generally, he should be conducted rapidly to his bed. This should be prepared before and during the time of the bath, and ought to be warmed by means of hot bottles, one of which should be left at the foot of the bed. The hot bath serves several purposes. The skin is induced to activity, the air of the room is rendered moist, and the air which the patient breathes is saturated, or nearly so, which, in the acute stage, is particularly comforting. A woollen jacket is welcome, but should not be applied for an hour or two after the hot bath, because not infrequently the patient breaks out into a warm perspiration after his bath and needs to have his night clothes changed. The hot bath is contra-indicated in cases where the patient is old or is the subject of heart failure, or of advanced arterio-sclerosis.

The steam kettle is of service when the atmosphere is very dry and the air is cold. It has, however, a depressing effect if kept in action too long. A good rule is to test the atmosphere oneself near to the patient and to see that it is not uncomfortable, and in the case of an adult to follow his wishes in respect of its employment. Relief certainly follows the use of the kettle, but it is wise to refrain from exhibiting it continuously and to alternate one hour on with one hour off. Various additions may be made to the water in



the kettle. Of these Tinct. Benz. Co. dr. 1 to the pint is soothing, and especially so if there is much tracheitis. The kettle should be so arranged as to discharge at a distance of about 2 feet and not so as to play directly on to the patient's face, where the steam tends to condense, and trickle on to his garments, etc. In the event of a kettle not being obtainable some comfort is derived from placing open basins of hot water about the room, one being somewhere in the neighbourhood of the fire. The temperature of the room should be kept between 60° and 70°. To achieve this desideratum a fire will usually be required to be kept up at night, which necessitates having some person delegated to attend to it. Ventilation from the external air should in the early stage be restricted, but the atmosphere in the sick room must not be allowed to become tainted or stagnant.

Poultices seem largely to have gone out of fashion, but much relief follows the application of a mustard leaf or poultice to the upper part of the chest and the lower part of the neck. The length of time which this should be applied varies from ten minutes up to an hour, depending on the individual. It should be left on till it causes distinct unpleasantness and till the underlying skin is of a dark red colour, but blistering is unnecessary. A light linseed poultice may now be applied, and if this treatment relieves the sense of rawness, the poultices may be renewed every two hours during the next two days.

In all cases it is important to attend to the bowels, and where the patient takes some particular purgative it is well to instruct him to take double the usual dose at once, followed by a seidlitz powder or other saline in the course of two or three hours. This purge should never be neglected or delayed.

In the early stage patients should be encouraged to drink freely. In most cases there is at this period no desire to take solid food. All drinks should be given hot. Natural lemonade is serviceable in rendering expectoration more easy, due no doubt to the decalcifying effect and may be taken ad lib. With the same object citrated milk (sodium citrate grs.  $1\frac{1}{2}$  to the ounce of milk) may be given. Where there is disinclination for anything by the mouth the liquid must be taken at regular intervals, every two or three hours, and

in such quantities that the patient shall receive four pints (in the case of an adult) in the 24 hours. In this case the administration of 15 grains of sodium bicarbonate in 3 oz. of warm water, half an hour before the nourishment, will help to induce an inclination to take something and also acts as an expectorant.

There is a great tendency for old and feeble persons to become lethargic, to check the cough, and to sink gradually down into the bed. This is a very bad sign, and must be combated by the use of stimulants. The patient must also be encouraged to expectorate. The value of such encouragement is often marked, and may induce him to make fresh efforts; unfortunately, there is a constant tendency to relapse. It is therefore advisable that this encouragement should be frequent, even to the extent of wearying the patient; he ought to be roused two or three times in the night and made to expectorate. Some practitioners recommend the administration of drugs to produce vomiting, in the hope of clearing the bronchial tubes by this act. It should, however, be remembered that emetics are nearly always cardiac depressants, and this depression largely counteracts a good effect of the emesis. For the same reasons, cold effusions to the chest and back are also not to be recommended.

In the first stage expectorants are indicated. Some combination of the following may be prescribed:—

|                       |   |   |          |
|-----------------------|---|---|----------|
| Ammonium Carbonate    | - | - | gr. 10,  |
| Liquor Ammoniae       | - | - | min. 15, |
| Spir. Ammon. Aromat.  | - | - | min. 30, |
| Liquor Ammon. Acetat. | - | - | dr. 4,   |

and other alkalies:—

|                |   |   |          |
|----------------|---|---|----------|
| Vinum Ipecac.  | - | - | min. 10. |
| Spir. Ætheris. | - | - | min. 30. |

If it is considered that the condition of dyspnœa is due in some measure to bronchial spasm—

|                      |   |   |             |
|----------------------|---|---|-------------|
| Tinct. Belladon.     | - | - | min. 7½, or |
| Tinct. Stramon.      | - | - | min. 10, or |
| Tinct. Lobel. Æther. | - | - | min. 5      |

may be added with advantage. These doses are intended for administration to adults four hourly, but a much better effect is produced when half the above doses are given every two

hours during the day, and the full dose four hourly at night. The question of alcohol is certain to be raised. As a rule alcohol is unnecessary, but it is unwise to prohibit it in the case of a person who has been in the habit of taking a moderate quantity. It should be given in definite quantities, and at prescribed intervals. A dose should be given the last thing at night in these cases with the object of promoting sleep.

In the early stage a visit should be made late at night to see if there is a prospect of a night's sleep. The cough may have worn the patient a good deal during the day, and sleep is very necessary. Probably the administration of the last dose of alcohol will be sufficient, but if not, Dover's powder gr. 20 should be ordered. Opium is contraindicated in patients with renal disease or cirrhosis of the liver, and in small children. In such cases it is better to try the effect of potassium bromide, gr. 20 (for an adult).

A vessel should be provided for the patient to expectorate into, and some antiseptic liquid placed in it. So long as its mouth is wide, and it cannot easily be upset, it does not matter what kind is employed.

Among the more serious symptoms to be looked for are rapid breathing, cyanosis, and general lethargy. The former are frequently associated together. In this type of case the question of venesection has to be considered. Cyanosis may be due either to failure of the right heart or to actual obstruction of the bronchial tube by a quantity of viscid secretion. In the former case venesection is beneficial, in the latter extremely deleterious. The best indication that the right heart is dilated is an increase of the deep cardiac dulness to the right of the sternum, displacement of the apex beat to the left, and dilated and pulsating veins in the neck. If it is clearly demonstrable that this dulness extends two or three fingers' breadth beyond the right margin of the sternum venesection is likely to be beneficial. It should be performed early and 10 to 20 oz. of blood may be removed under antiseptic precautions from some vein which is easily reached, generally one in the forearm. In these cases the pulse is generally regular and not as fast as one might expect. The best results of this treatment are obtained in persons above the age of 45 years, who show signs of emphysema, but in the young the



results are disappointing. Where there is cyanosis, and examination fails to reveal signs of a dilated right heart, the best treatment is to add stimulants, such as strychnine, digitalis, or ether, and endeavour to tide the patient over the next 24 to 48 hours. Digitalis is especially valuable in the cases of children. In those of persons who have very little chest expansion and who are in much distress relief may follow the application of a binder to the abdomen. Should the patient, however, not feel relief, but rather discomfort, from this procedure, it should at once be abandoned. Compression of the lower part of the chest as an aid to expiration has been recommended, but it produces marked discomfort. The administration of oxygen where dyspnoea is marked should, theoretically, be of extreme value, but usually it is not well tolerated. Patients cannot stand a stream of the cold, dry gas full on to their faces. The right way to apply the oxygen is to run the tube from the cylinder into a Woolf's bottle, the nozzle delivery tube being below the surface of the water. The end of the second tube is above the surface of the water, and leads to a glass funnel which is placed about 18 inches from the patient's face. The Woolf's bottle should be half filled with warm water, and should also stand in a large basin of water kept at 100°. By this means the oxygen bubbles through warm water, is delivered warm and moist, and is of some service, though on the whole the results are disappointing. Oxygen has some value in producing sleep, but, as a rule, is not successful in diminishing the rapidity of the respiration.

If treatment has been carried out on these lines and there is no marked improvement at the end of four or five days, it is advisable to seriously reconsider the diagnosis and to examine the patient again as if it was the first time of seeing him. The difficulties which are most likely to arise and lead to error of diagnosis are, first, that the case is not one of bronchitis, but that the condition is due to a dilated heart with back-pressure signs in the lungs. The most common cardiac lesion to give rise to this difficulty is mitral stenosis. In the second stage of dilatation, with this lesion, frequently no murmur can be detected. The short tapping character of the first sound, in combination with the small high-tension pulse and the

increased area of dulness to the right of the sternum, should give the clue to the diagnosis. There is also commonly a fair amount of blood in the expectoration. A preceding history of rheumatic fever would give support to this diagnosis. Secondly, acute pulmonary tuberculosis may begin as an attack of acute bronchitis. In this case there will usually be a history of a cold dating from some attack commonly called influenza two or three months previously, and there may have been a considerable amount of wasting. A thorough examination of the sputum will generally reveal the presence of tubercle bacilli, and an examination of the chest will demonstrate the presence of lesions which are localised and not general in distribution. Thirdly, the first signs of typhoid fever may be a very severe attack of bronchitis. Fourthly, an attack resembling acute bronchitis may be one of the first signs of uræmia. It is hardly likely that a case of pneumonia, or pleurisy with effusion, will give rise to such symptoms, but pressure on the outer side of the bronchus by an aneurism or a new growth may give rise to some difficulty in diagnosis. As we have already said, whooping-cough not infrequently begins with an attack of bronchitis, which, in an adult especially, may last for a fortnight or three weeks before the characteristic cough develops, during the whole of which time the temperature may be considerably raised; and an attack of bronchitis is also a common symptom at the onset of measles.

Granted, however, that the case is a genuine one of severe bronchitis which has taken an average course, at the end of a week or ten days the temperature should have fallen to normal. The cough should be easy and the expectoration liquid, frothy, and easily brought up, *i.e.*, the patient has passed from the second to the third stage. It is now time to discontinue the expectorants and to give the patient a more liberal diet and to prescribe tonics. It is most important not to forget the bowels. A daily evacuation must be obtained by the administration of purgatives if necessary. The usual salines are the best. It is well, if possible, to keep the patient in bed till the expectoration has almost ceased and begins to contain black points. An exception should be made in the case of the elderly, and especially when in this stage there is a tendency to the development of œdema at the

bases of the lung. These patients often improve when sitting up in a chair near the fire. There is no doubt that cod-liver oil is the best drug to administer at this time. It should be given in two-drachm doses to which a minim of creosote is added thrice daily after food. It is unnecessary to prescribe larger doses. In the average case the expectoration will almost have ceased a fortnight after the commencement of the attack. The cod-liver oil may now be abandoned and a tonic, such as Easton's Syrup or one containing iron and strychnine, may be prescribed, and, if possible, the patient should be sent away to some warm seaside place for ten days or a fortnight. Should, however, this result not follow, the case must be classified as one of chronic bronchitis and the treatment should be the same as for that condition.

Under chronic bronchitis we have to distinguish cases where bronchitis is continuous, cases where attacks of bronchitis recur, and cases in which the bronchitis does not resolve. The successful treatment of this type of case depends upon the discovery of something abnormal which keeps up the condition. Recurrent attacks of bronchitis frequently occur amongst the mouth-breathers, and in this class of case the nasal obstruction must be remedied by appropriate treatment, and the patient must be encouraged to breathe normally through the nose. The tonsils should also be inspected, and if any disease is present it must be treated. The mouth should also be examined and any carious teeth removed. A septic condition of the gums must also be alleviated. It should be remembered that an infection is due partly to the number of organisms which invade and partly to the relative virulence of the same. It is, therefore, well to see to the cleanliness of this area.

Certain cases are met with in which spasmodic attacks resembling asthma occur periodically and are followed by an attack of bronchitis, or such spasmodic attacks take place during the course of an attack of chronic bronchitis. In these cases it will be found that some organism is present in the sputum, this being commonly one of the streptococci. In such cases it is well to try the effect of a small dose, two or three grains, of iodide of potash, three times a day after food, especially if a high-tension pulse is also present. It may advantageously be combined with three minims of Liq.



*Arsenicalis*. This treatment frequently produces a very marked effect. If an examination of the sputum shows the presence of many organisms and the expectoration is liquid, a Yeo's inhaler may be employed, a few drops of the following being placed on the sponge :—

|   |                   |   |   |   |    |      |
|---|-------------------|---|---|---|----|------|
| R | Creosote          | - | - | - | -  | 3ij. |
|   | Thymol            | - | - | - | -  | 3ii. |
|   | Ac. Carbolic      | - | - | - | -  | 3i.  |
|   | Spirit Chloroform | - | - |   | ad | 3j.  |

Should this treatment not be as satisfactory as anticipated a good result may be obtained in some cases by the injection of a vaccine obtained from the infecting organism.

In this class of case it is also important to ascertain that the digestion is normal. If it is found that the patient is constipated or suffers from flatulence these faults must be corrected.

The subjects of emphysema are especially liable to recurrent and continuous attacks of bronchitis, and it is advisable that they should be away from this country from November to May, or should reside in some south coast district. The liability to attacks is reduced by maintaining a good standard of general health, and it is important that the tendency which exists among such persons to put on fat should be combated. This is best done by diminishing the amount of carbohydrate food and by ordering a suitable amount of daily exercise and especially breathing exercises. By this means the abdominal muscles are kept in good order. The heart also does not become embarrassed by the presence of superfluous fat. In all these cases cod-liver oil and creosote is the best prescription to order.

Lastly, it should not be forgotten that a foreign body in the bronchus will give rise to a profuse expectoration and other symptoms of chronic bronchitis, and may lead to the formation of a bronchiectasis if it lasts for any time.



## BOILS AND CARBUNCLES AND THEIR TREATMENT.

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THERE are very many eruptions which are the result of the invasion of the skin by "pus-cocci," and numerous skin affections which were formerly regarded as of non-microbic nature are now included in this class. Of these eruptions the first which was definitely proved to be due to infection by the pus organisms was the furuncle or boil. Garré, in 1885, and Bockhart, in 1887, produced upon their own skins follicular pustulations and boils by the rubbing in of staphylococcus cultures several generations removed from those obtained from the original source; and the same organisms were obtained again from the pustules thus produced. For many years after this it was believed that other eruptions, such as impetigo contagiosa and ecthyma, were also the result of staphylococcic infection, and the name "staphylococcia purulenta cutanea" was suggested for these affections as a group. But Leroux, in 1892, Kurth, in 1893, Brocher, in 1896, and Balzer and Griffin, in 1897, succeeded in demonstrating the presence of the streptococcus in the lesions of impetigo contagiosa. And in 1901 Sabouraud clearly demonstrated that there were really two distinct groups of these so-called pus-coccic infections, one a streptococcic infection, the other staphylococcic, and he showed that the error which had hitherto been made was due to the difficulty in isolating the streptococcus from lesions which almost invariably became early invaded by a secondary infection of staphylococcus.

The "streptococcic" eruptions are characterised by an inflammatory reaction in which serous exudation is a more marked feature than pus formation, and the type of lesion is a superficial vesicle or phlyctenule which tends generally to dry rapidly into a crust. This group includes the common form of impetigo contagiosa and its numerous varieties, circinate

impetigo, bullous impetigo, pemphigus neonatorum, ecthyma, and probably also many chronic forms of eruption which have hitherto been regarded as eczemas. Erysipelas, too, belongs of course to this group.

The staphylococcic eruptions are all characterised by pus formation, that is, by inflammatory cell exudation rather than serous exudation, and, further, the inflammatory lesions are situated, not on the surface of the skin, but in and around the hair follicles. This group includes pustular acne, sycosis of the beard region, follicular pustulations excited by local irritants (as tar acne), multiple abscesses of infants, and boils and carbuncles. It is probable also that many chronic skin eruptions, which, like the chronic streptococcic eruptions, have hitherto been classed as eczemas, are of staphylococcic origin.

The streptococcic eruptions are said to be due to the streptococcus of Fehleisen, but it would seem that the micro-organism must be of a milder strain than that which produces erysipelas, though this is a point which has not yet been worked out. The staphylococcic eruptions are due to staphylococcus aureus, or albus, or to a mixed infection, and some of the milder eruptions are possibly the result of staphylococcus epidermidis albus.

At present we are concerned only with the particular forms of staphylococcic infection known as boils and carbuncles, and although these two affections are closely allied, there are sufficient differences in their clinical characters and in the means adopted for their treatment to make it more convenient to consider them separately.

#### BOILS OR FURUNCLES.

In its earliest stage a boil consists of a small itching and painful swelling, situated somewhat deeply in the skin. It rapidly enlarges to form a conical, hard, red, tender and painful tumour, which in the course of a few days becomes softer towards its apex, and there presents a minute pustule. The pustule gives way, and a small quantity of pus escapes. The area of softening extends, and a more abundant discharge of pus takes place, leaving a large crateriform opening, at the bottom of which is seen a slough or core. By this time the



acuteness of the inflammation and the pain have subsided. In the course of the next few days the slough separates, and a deep ulceration is left, which gradually heals by granulation, with more or less scarring. Sometimes a boil begins as a superficial hair-centred pustule, and the deeper true furuncular inflammation appears later. The pathological explanation of these clinical features of the boil is as follows: The *staphylococcus aureus* having found its way into the hair follicle develops along the hair until at a point deep down in the follicle it forms a colony. As a result of the presence of this growing colony of staphylococci a violent reaction of the tissues takes place, large numbers of leucocytes are hurried to the spot, the normal structures immediately around the colony become choked, they die, and are separated from the surrounding tissues, forming a slough, in the centre of which is the colony of staphylococci. Around and in the slough is the barrier of phagocytic pus cells. In this way the invading microbes become cut off from the rest of the tissues, and finally are cast from them *en bloc*. The subsidence of the inflammation at the moment when the boil breaks and discharges thus corresponds with the defeat and throwing off of the microbic colony.

In its early stages a boil gives rise to much pain and tenderness, and this feature is all the more marked when the lesion is situated in dense unyielding structures, as in the external meatus, in the nostril, or on the perinæum. When in the external meatus especially the pain and general disturbance are often out of all proportion to the size of the boil. Owing to the fact that infection takes place by the hair follicles we find that although there may be only one lesion, in many instances the infection is multiple from the first, or that secondary lesions are very apt to arise around the primary boil. Although the *staphylococcus aureus* is the essential cause of these lesions, yet there are often predisposing causes, local or general. Local traumatism, for example, are a common predisposing cause, as in the familiar case of boils on the buttocks of rowing men, and in boils which occur upon the back of the neck, where there is friction from the collar. A pruritic eruption, such as eczema, pediculosis, or scabies (and scabies particularly), may be the exciting cause of boils. Often they are secondary to

impetigo contagiosa, just as we see sometimes a follicular pustular sycosis of the beard developing on a simple impetiginous infection of that region, or multiple abscesses of infants,—which are really deep-seated peri-follicular furuncles—following a generalised impetigo or pemphigus neonatorum in a baby. Then there are certain conditions of body which predispose to boils. Particularly important are diabetes, or Bright's disease, so that an examination of the urine is advisable in all patients with boils, since their presence may sometimes first reveal these more serious complaints. Boils are also very liable to occur in persons who are convalescent from some infectious disease, and any condition producing lowered vitality, such as overwork at a sedentary occupation, overtraining, etc., may act as a predisposing factor.

#### TREATMENT OF BOILS.

When an eruption of the skin which is due to microbic infection involves only the superficial parts of the epidermis its cure is generally comparatively easy. On the other hand, the treatment of skin affections which are the result of microbic invasion of the deeper parts of the skin or of its appendages naturally presents greater difficulties, because the micro-organisms cannot be reached by the antiparasitic applications. Hence it is that the impetigo and allied eruptions of streptococcic origin are readily cured by removing the crusts and applying mild local antiseptics, while the follicular pustulations of staphylococcic origin—such as sycosis, boils, and carbuncles—are more difficult to deal with. In the treatment of boils attempts have been made to reach and destroy the causative cocci by the hypodermic injection of antiseptics, such as carbolic acid, often with a certain amount of success. But there is another way of combating the invading micro-organisms, namely, that of stimulating the natural fighting powers of the invaded tissues, which seems likely eventually to supersede other methods, and to make it unnecessary to attempt local destruction by means of antiseptics. I refer, of course, to Wright's method of vaccine inoculation, the principles of which are now so well known that they need not be here recalled. We have, of course, been unknowingly applying these principles to the treatment of

boils from time immemorial, for when we use a hot application for these eruptions we are stimulating the powers of reaction of the invaded tissues, and by attracting more blood to the part we are increasing the amount present locally of those substances which the body manufactures for the destruction of the micro-organisms, or for their preparation for destruction by the pus cells, namely, the substances which Wright has called "opsonins." The introduction of the vaccine treatment is, however, of comparatively recent date, and it cannot yet be said to have entirely replaced the older methods, particularly in regard to chronic furunculosis, where the results are not nearly so successful as in the more acute cases. It will be well, therefore, to discuss some of the older methods which, as in all affections which present much difficulty in their cure, are very numerous.

(1) Many applications have been recommended with the object of reducing or aborting the boil in its early stage before it softens and points. Such are, the application of tincture of iodine, of nitrate of silver, of collodion, and of Unna's carbolic-mercury plaster—mull. One of the best of these applications is collodion. If the boil and the parts immediately around be painted with collodion on its first appearance, and the painting be repeated every three or four hours, each time peeling off the old layer, it will in many instances disappear without coming to a head.

(2) The injection of one or two drops of pure carbolic acid into an early boil will sometimes cause it to dry up. The immediate effect may be an exacerbation of the redness and swelling, but this rapidly subsides and the boil gradually disappears. Carbolic acid may also be used after the boil has ruptured, the cavity being syringed out with a 1 in 20 solution and finally a drop of pure carbolic left in it.

(3) Boils should not, as a rule, be incised, certainly not at an early stage, but when the boil has softened and the pus has failed to escape, it may be let out by a small incision. This applies particularly to chronic furunculosis. At quite an early stage it is recommended to puncture a boil with the fine point of a galvano-cautery, and this is said often to cause the boil to abort.

(4) A very old and much used remedy is that of hot



omentations ; poultices should be avoided, but a large hot boric acid fomentation, either to a single boil, or covering the whole area affected by a group of boils, and changed every few hours, is very useful in relieving the pain and in subduing the inflammation. It is essential that the fomentations be changed frequently or they are likely to spread the infection. At each change the parts should be well bathed for ten minutes with hot water, and afterwards with a 1 in 4000 solution of mercury biniodide. If the boil be situated on the hand or forearm, a prolonged soaking in hot boric lotion may be given between each change of dressing. Although treatment by hot fomentations is likely to be superseded by vaccine injections in the management of acute cases, it is still a very useful method in the more chronic eruptions where vaccines often fail. Even isolated boils of long standing, where the tissues have become infiltrated and hard, may generally be got rid of by hot fomentation if the patient will take the trouble to carry out the treatment thoroughly for a considerable period.

(5) Another method of local treatment of boils which, if properly carried out, is generally very successful, is that of glycerine dressings recommended by Gallois.<sup>1</sup> Each boil is first of all painted with a solution of iodine (2 parts) in acetone (5 parts), unless the boil is broken, when it is not painted. A large pad of lint is then wrung out in boiled water, then saturated with glycerine, and applied to the whole area affected by the boils. This is covered with a layer of ordinary non-absorbent wool, and the whole carefully bandaged. This dressing is changed once or twice a day. The boils quickly become less inflamed and soon dry up altogether. Quite recently a glycerine method has been recommended by Ogier Ward,<sup>2</sup> which is even more simple than that of Gallois. A pledget of cotton-wool soaked in carbolic glycerine is applied to the boil and covered with gutta-percha tissue and a bandage. As soon as the pus discharges some of the glycerine is inserted into the small cavity by means of a glass syringe and a fresh pad of glycerine applied. The slough separates, and under a final pad of glycerine the cavity speedily closes.

(6) Bier's treatment by means of specially constructed "suction-glasses" has been highly extolled in the treatment

of boils, but of this method I have had no personal experience.

(7) There are two forms of internal medication which have for long had a reputation in the treatment of furunculosis, namely, the administration of calcium sulphide, and of yeast. Calcium sulphide was very highly recommended by Ringer for the treatment of boils. It seems undoubtedly to do good in some cases, but its action is very uncertain. Possibly it is not always administered as Ringer recommended. He directed that the sulphide of calcium should be given as a powder, in doses, for an adult, of  $\frac{1}{10}$  to  $\frac{1}{2}$  grain mixed with sugar of milk, taken hourly, or every second or third hour as the case might require, and that the medicine should be compounded daily on account of its tendency to become rapidly oxidised. This remedy is well worth a trial in obstinate cases of chronic furunculosis. Sulphur has also been used in doses of  $\frac{1}{2}$  to 1 teaspoonful of the flowers of sulphur every morning, increasing the dose later if necessary. Yeast is another remedy which has long been employed in the treatment of boils, and one which has a great reputation among country folk. It has recently been strongly recommended by Brocq,<sup>3</sup> of Paris. He gives as a dose one teaspoonful of fresh brewer's yeast three times a day in water at the beginning of a meal. If the patient can tolerate it larger doses may be given, but in some persons it produces colic. In some cases the results obtained by the administration of yeast are remarkable, and comparable with those presently to be described produced by vaccines. But this treatment more often fails altogether. Recently many extracts of yeast have been prepared to be administered in pill-form. These preparations sometimes give good results in chronic furunculosis, and it is worthy of note that they generally have a mildly laxative effect, which may be useful in many cases associated with chronic constipation.

(8) More especially in cases of chronic furunculosis it is necessary to attend to the general health, and a holiday in the open air will often do much for a patient whose occupation is within doors and sedentary. If the patient is found to have diabetes or Bright's disease, he must of course be put under suitable treatment — mainly dietetic — for these

complaints.

(9) We now come to the consideration of the treatment of boils by vaccines. There is probably no disease in which the good results of vaccine treatment are so well seen as in acute furunculosis, or in cases where this condition is not of long standing. In a case of boils of recent origin one can predict almost with certainty that one or two injections will cure the complaint. In these cases it is not necessary to make a special vaccine. Stock vaccines of *staphylococcus aureus* or of mixed cultures may be used. A dose of 100 millions is given as an initial dose. It is to be injected with antiseptic precautions beneath the skin of the arm or of the back. In a day or two the lesions will have considerably diminished in size and will have become much less markedly inflammatory. Three or four days after the first dose a second dose of 250 millions is given, and generally this will suffice to clear up the boils entirely. It is only, however, when the infection is of recent date that such favourable results are obtained. In cases of chronic furunculosis they are by no means so uniformly good. It appears as though the patient's powers of resistance had already been stimulated to their full extent by the long continued presence of the staphylococic infection. Often a temporary improvement takes place followed by a fresh outbreak of new lesions. In chronic furunculosis the initial dose should be, as in acute cases, 100 millions. This is followed in a week or ten days by a second dose of 200 millions and by further doses at the same intervals over a period of six or seven weeks, increasing the dose each time by 100 millions so long as improvement continues, diminishing it if furunculosis tends to increase. In chronic cases the use of hot fomentations is often a valuable adjunct to the vaccine treatment.

(10) The administration of horse-serum or of serums specially prepared for specific infections, as anti-diphtheritic serum or anti-streptococcic serum, in boils, will be referred to when dealing with the treatment of carbuncle.

(11) There is yet one other method of treatment which is of great value for the indurated lesions of chronic furunculosis, namely, the application of X-rays. The dose should be a full Sabouraud pastille dose to the affected area at intervals



of four weeks. In more acute cases, X-ray applications, although they will eventually cure the disease, are liable to produce an alarming exacerbation of the inflammation and of the pustulation, lasting perhaps several weeks, and therefore their use in these cases is better avoided.

To sum up, it may be said that in cases of acute or recent eruptions of boils one may expect a cure by the use of vaccines; that there are, however, many methods of local application which give excellent results, particularly, collodion painting in quite early lesions, injection of carbolic acid, hot fomentations, and glycerine dressings; that in chronic furunculosis vaccines may be given a trial; but that the best results are to be obtained from continuous boric-acid fomentations, and from X-ray applications to lesions which are much indurated.

#### CARBUNCLE.

A carbuncle differs from a boil in that it is larger and flatter, involving, not one, but many pilo-sebaceous follicles. It differs, too, in that it tends to spread peripherally and not by invasion of follicles at a distance, so that the lesion, however large it may become, usually remains single. The symptoms, both local and constitutional, are usually much more severe. On account of the greater severity and different character of the inflammatory swelling, it has been thought that some other micro-organism, in addition to the *staphylococcus aureus*, might be concerned, and a streptococcic infection has been suggested. But there is as yet no proof of this, and with our present knowledge we must regard the *staphylococcus aureus* as the sole cause of the lesion. Carbuncle occurs generally in persons of middle life or in elderly people, and more commonly in men than in women. The patient is almost always in a poor state of health, either from overwork, improper food, or bad hygienic surroundings, or he may be the subject of diabetes or of Bright's disease. The situations most favoured by the carbuncle are, the back of the neck, the shoulders, and the buttocks. It may also occur upon the scalp, or face, or upon the limbs.

In those broken down in health, in aged people and in diabetics, or in patients with albuminuria, carbuncle is always a grave disease, and may be fatal from exhaustion by pain and

fever, or from septic absorption. In the somewhat rare form of carbuncle occurring upon the upper lip, usually in young subjects, and accompanied by œdematous swelling of the face there is a special liability to infective phlebitis with sinus thrombosis, meningitis and death. With these exceptions, that is to say, in the generality of cases, the prognosis is good. In an ordinary case the lesion begins as a small, hard, painful lump, which quickly increases in size to form a firm, red, tender, circular swelling. It may reach a size of several inches in diameter, when it begins to show points of softening on its surface, which break, giving exit to blood-stained pus, and producing the well-known cribriform aspect of the matured carbuncle. This process will have occupied a week or more, and during this period the patient will have been feeling ill, sometimes with a high temperature, often without any marked fever, and suffering much from the pain and tenderness of the swelling. During the next ten days to two or three weeks the opening enlarges and the slough softens and gradually comes away, leaving a more or less large healthy ulcer, which eventually heals with a much smaller scar than would be expected. Up to the time that the slough begins to separate the temperature remains more or less raised, and then it begins to fall, with cessation of the pain and improvement in the general condition. In bad cases, the lesion may continue to spread in spite of the separation of the slough, the patient falling into a typhoid condition, or developing symptoms of septic absorption or of pyæmia with rigors and intermitting high temperature. Although the majority of cases run the milder course, it is never safe to predict that they will do so, and, therefore, every case, however mild, is to be looked upon as a possible source of more serious trouble, and a carefully thought-out plan of treatment should be adopted from the first.

#### TREATMENT OF CARBUNCLE.

Formerly the routine treatment of carbuncle was that of deep crucial incisions through the lesion and beyond it into the surrounding normal tissues, while the patient was given plenty of nourishing food and abundant stimulants. Forty years ago Sir James Paget in a lecture published in *The Lancet* deprecated this method of crucial incision, and advocated a

palliative treatment of careful dressing, ordinary diet, plenty of fresh air, and stimulants only in moderation. For many years, however, the crucial incisions were still employed, and it is only comparatively recently that they have been almost entirely abandoned in favour of the more radical surgical measures of curetting or even of complete excision of the lesion. Palliative measures are still employed in the early stages, while there are some authorities who use them throughout and do not resort to surgery in any case. Other non-operative measures also are sometimes adopted, such as collodion dressings and carbolic-acid injections, and, quite recently, the vaccine treatment of Wright.

(1) The local treatment adopted by Paget was to cover the carbuncle with *emplastrum plumbi* spread upon leather, with a hole in the centre through which the pus and slough could come away, the dressing being changed occasionally. For a large carbuncle he used *ung. resinæ* spread over the whole carbuncle and covered with a linseed poultice, frequently changed, and at every change the carbuncle to be fomented with very hot water. The cavities were syringed out frequently with diluted carbolic acid, and carefully plugged with some soft substance spread with the ointment. A similar treatment has been strongly recommended by Bulkley<sup>4</sup> of New York, who covers the area affected with an ointment (*ac. carbol gr. x., extr. ergot. fl. ʒj., pulv. amyli, euonymin aa ʒij., ung. aq. rosæ ʒj.*) thickly spread on cotton-wool and kept applied by adhesive plaster. He applies it even to large carbuncles, and, writing in 1897, he states that he has used this method with complete success in every case of carbuncle under his care for fifteen years.

(2) Carbolic-acid injections are employed much in the same way as for boils, with the difference that several injections are made at various points in the margin of the carbuncle, and it is claimed that one or two such treatments will suffice for a cure.

(3) A very old method, recently revived,<sup>5</sup> is that of painting a ring of collodion round the carbuncle. A mixture of equal parts of flexile and non-flexile collodion is used. The skin around the carbuncle is painted daily, each day encroaching more and more over the red areola which surrounds it.



(4) The method of extirpation by complete excision or of partial excision and scraping, now so largely practised, was first introduced into this country by Rushton Parker<sup>6</sup> in 1888, who claimed that complete extirpation was a plan which gave immediate relief to pain and removed the chances of septic poisoning. The very largest carbuncles could be treated in this way, and it was important not to rely upon thorough scraping alone, but to remove the diseased tissue, thoroughly cutting away with knife or scissors what could not be scraped away.

The method of scraping or erasion, generally followed by the application of a strong antiseptic, is now very largely employed. In the malignant carbuncle of the lip the early adoption of such radical measures is imperative.

(5) Vaccine Treatment.—It is natural that staphylococcic vaccines have been largely used in the treatment of carbuncle. In many cases, when the carbuncle is not large, or not yet advanced, the results are often strikingly good, so much so that no other treatment than protection of the lesion is required. The dosage is the same as for boils, beginning with 100 millions and giving a second dose of 200 millions or more after an interval of three or four days. In more advanced cases staphylococcic injections may still be used with advantage, even though surgical treatment may be contemplated, and later be carried out.

In a case reported by Ashe<sup>7</sup> a rapid cure resulted from the use of anti-streptococcic serum, a fact which does not necessarily prove that streptococcus is one of the causative agents of the disease, for it is well known that staphylococcic infections will sometimes clear up rapidly when a simple horse-serum, or other serums, such as anti-diphtheritic serum, are injected, or given by the mouth. The administration of horse-serum in carbuncles or in boils is a treatment which seems worthy of further trial.<sup>8</sup>

(6) As regards internal treatment, the tendency now is to prescribe an ordinary diet, to avoid stimulants, and to see that the patient gets plenty of fresh air, and not necessarily to confine him to bed. For the relief of pain, opium is valuable in the early stages, and it is especially useful in

those patients who have diabetes ; but it must, of course, be withheld if the patient have albuminuria.

Briefly, it may be said, that if the case is seen when the lesion is small, it may be painted with collodion or injected with carbolic acid, but, better still, merely protected with a boric acid fomentation and a thick pad of wool, and a staphylococcic vaccine administered ; the injection to be repeated in three or four days if improvement takes place. If the lesion continues to spread in spite of the vaccine, then it should be treated surgically by complete excision, or by scraping and cutting away all diseased tissue. In the case of very large carbuncles, complete erasion is the treatment which gives most rapid relief to all symptoms, and this treatment is now adopted by very many surgeons irrespective of the size of the carbuncle.

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## CORN AND BUNIONS.

By J. FOSTER PALMER, M.R.C.S., L.R.C.P.

THE Physician is telling us that, sooner or later, by means of prophylactic and curative inoculations, disease will be under complete control—that the knife of the surgeon is at present a necessary evil, but only a temporary one, soon to be rendered useless by the progress of bacteriological research; the Surgeon tells us that the Physician is entirely behind the times, and that all he does can be better done by the Surgeon, who has a greater and more certain resource behind him; while the Bacteriologist pats them both on the back, and hopes to conquer the pathogenic world by his own methods.

Meanwhile there are smaller matters liable to be overlooked. There are still some minor ailments, at least, which are not produced by pathogenic microbes, and which appear quite too trivial for the surgeon, who is looking out for a large or delicate operation. But are they always so small? Hardly, in the aggregate. If all the suffering which results from corns and bunions could be collected together, like the numerous small scrapings which go to make up the income-tax, it would amount to something considerable in the aggregate. Yet neither the surgeon nor the general clinician cares greatly to study them, or even to examine and advise about them; and the patients, for patients they really are, are driven to the chiropodist, or, at any rate, to follow his methods. And it is by these methods that corns become painful and permanent. The greatest sufferers from corns are those who cut them periodically. Relief is obtained for a short time, followed by increased suffering. We can hardly expect people to consult us as to the prevention of corns, but there are very few corns that could not be cured by simple and painless treatment in a few weeks.

The ætiology of corns is not so simple as would at first sight appear. That this is so is evident from the fact that three such great thinkers and observers as John Hunter, Paget, and Rindfleisch all hold somewhat different views. Hunter, for instance, says that pressure from within causes



atrophy, and pressure from without causes hypertrophy.<sup>1</sup> It is difficult to see how the one can exist without the other—how, in fact, there can be pressure without resistance. Hunter says, “A corn is a thickened cuticle arising from external pressure, which is præternatural and excessive.”<sup>2</sup> But experience seems to show that pressure alone tends to produce absorption and atrophy, friction to produce hypertrophy. Are not bed-sores examples of the former condition? It is pressure, not friction, that causes the skin to disappear. This is especially evident in cases of paralysis, where increased action is impossible. The latter condition, hypertrophy, within certain limits, is protective, but when excessive it becomes a morbid growth.

Paget holds a different view. Hypertrophy he considers to be due, not to pressure, but to excessive action, “When,” he says, “the conditions alter so that a part is more than usually exercised in its office, then it manifests a power of renewing or accelerating its growth. It is as if each healthy part had a reserve power of growth and development, which it puts forth in the time of emergency.”<sup>3</sup> In case of increased action of the skin, for example, the waste of tissue is increased, but the epidermis “does not grow thin; nay, it grows thicker, to protect the cutis; it puts forth, as it were, a reserve power, which is enough not only to repair all amount of waste within certain limits but to increase the quantity of tissue to the amount required.”<sup>4</sup>

If this be so, it is clear that clavus is not the result of pressure alone. There must be something else. In other words, tight boots will not cause corns. You might, for instance, lie in bed for twelve months with tight boots on and get no corns, whatever else you might get. Paget, it is true, says that pressure causes hypertrophy,<sup>5</sup> but this seems inconsistent with his statement quoted above, if the words are taken in their obvious sense. He further says that constant pressure causes atrophy, but that occasional or intermittent pressure

<sup>1</sup> *Surgical Works of John Hunter*, Palmer's edition, vol. iii., p. 466.

<sup>2</sup> *Ibid.*, vol. i., p. 561.

<sup>3</sup> *Lectures on Surgical Pathology*, Turner's edition, 1863, p. 48.

<sup>4</sup> *Ibid.*, p. 49.

<sup>5</sup> *Ibid.*, p. 65.

causes hypertrophy.<sup>1</sup> I submit that even intermittent pressure is not necessarily friction, and that it is the friction, not the pressure, whether constant or intermittent, which produces corns. A corn is just a hypertrophy of the cuticle which

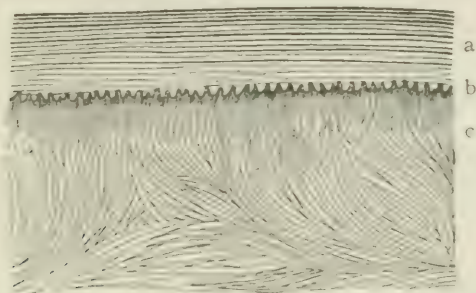


Fig. 1A.—Normal skin; a, cuticle; b, rete mucosum; c, corium.

passes beyond physiological limits. When such hypertrophy is physiological it is called a callosity, when pathological a corn. A callosity is not a corn, though they are often spoken of as if they were synonymous. Tylosis is one thing and clavus is another. Tylosis is protective, clavus is destructive. In tylosis there is no atrophy, no destruction of the cutis. In clavus the indurated cuticle, growing in both directions, presses upon the underlying corium, and in many cases pierces completely through it and presses on the tissue beneath.<sup>2</sup> The growths on the finger-tips of the left hand of the violinist are callosities, and enable him to play better. There is plenty of pressure here, and intermittent pressure at that, but the friction is only occasional and not continuous, so that there is no morbid growth. If the friction and pressure were continuous it is hardly conceivable that he would be able to practise ten, or even six, hours a day. There would appear to be sufficient friction and intermittent pressure to produce the superficial hypertrophy, but not enough to cause atrophy beneath. With the harp there is both pressure and

<sup>1</sup> *Ibid.*, p. 66.

<sup>2</sup> Tylosis is, of course, derived from the Greek *τύλος*, a callosity produced by labour, or an enlargement or protuberance generally. Clavus, on the other hand, is the Latin *clavus*, a nail. A corn, at its worst, may be fairly taken to represent a foreign body, such as a nail, driven in through the two layers of skin, and penetrating to the tissue lying beneath it.

riktion. Rindfleisch, again, says that corns and callosities are both caused by external pressure, but that "the difference in the results depends on a variation in its mode of action; if the

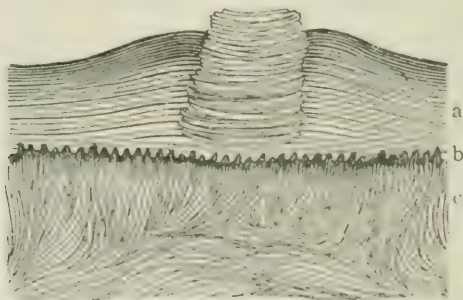


Fig. 1B.—Tylosis; a, cuticle; b, rete mucosum; c, corium.

point at which the two opposing forces come into collision coincides accurately with the point of contact between the compressed part and the compressing part, a callosity is produced; if, on the other hand, the two points do not coincide—if the compressed part is capable of yielding to the pressure—a corn results.”<sup>1</sup>

But, if this is the case, why is the epidermis hypertrophied and the corium atrophied? Both are subject to pressure. But the epidermis is subject to pressure and friction both, the corium to pressure only. This makes the difference. The rubbing against the boot excrescences gives the “increased

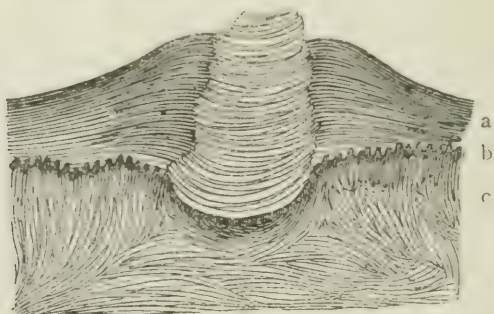


Fig. 1C.—Clavus; a, cuticle; b, rete mucosum; c, corium.

<sup>1</sup> *Manual of Pathological Histology*, Baxter's translation, New Sydenham Society, 1872, vol. i., p. 357.



action," the "more than usual exercise" of Paget, and while the corium is absorbed, the cuticle hypertrophies. It not only restores its waste, but it goes further. It does not know when to stop. It gets big and becomes aggressive. And the bigger it gets the more it presses on the corium. Meanwhile the corium is unable to take any exercise. It knows nothing of the struggle with the uneven boots on the other side of the cuticle. It feels only the pressure, and is crushed out of existence. The hypertrophied cuticle will then be in immediate contact with the subcutaneous cellular tissue, or lie on a joint or sheath of a tendon, in which case a bursa usually results (Fig. 2).

Why a bursa should form I cannot pretend to explain. It is very easy to say that it is a provision of Nature to protect the underlying parts, bone or tendon. But this is the result, not the cause, and in no way helps to explain the *modus operandi*. The bursa appears to be just a further development of the enlarged cuticle round some of the spaces

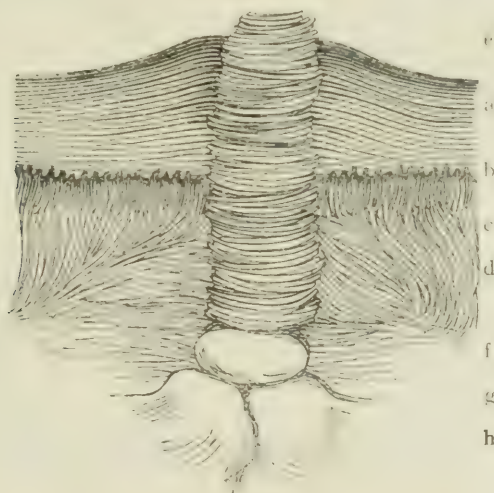


Fig. 2.—a, Cuticle; b, rete mucosum; c, corium; d, subcutaneous cellular tissue; e, hypertrophied cuticle = corn; f, bursa; g, joint distorted by ill-fitting boot; h, heads of bones separated from hypertrophied cuticle by bursa.

in the subcutaneous areolar tissue. But why should it take this particular form? And why should Nature, having allowed

the corn to torture, and actually to destroy, the corium, suddenly become so very careful lest it should injure the joint or tendon beneath it? I am inclined to doubt its beneficent intentions, and to suspect that it has some sinister designs on these structures after all. I submit, therefore, that it is well not to put too much faith in bursæ, but to endeavour to restore both corn and bursa to their normal condition at the earliest possible opportunity.

This brings me to the subject of bunions. A bunion is a bursa in its glory. The name is applied to a bursa arising on one of the tarsal or metatarsal joints, and assimilating itself, as regards its internal secretion, to the joint it overlies, for it contains synovial fluid. But there is another difference. A bunion is primary, not secondary, like the bursæ developed under corns. There is no great preliminary hypertrophy of the cuticle, as in the latter. The bursa develops at once between the joint and the external pressure. If there is hypertrophy of the cuticle it usually follows, not precedes. There is always, too, a distortion of the underlying joint, which is, in the great majority of cases, the "gout" joint. This distortion may proceed either from shortness of the boot, from excessive deviation outwards of its inner edge, from prolonged standing on the inner edge of the foot with weakened ligaments, or from heredity. This last cause, which can hardly be denied, seems to suggest the transmissibility of acquired characteristics, for the first distortion must have been acquired.<sup>1</sup> Whatever the cause, there is only one method of cure, which is, by artificial support, to bring the axis of the phalanges into the same straight line as that of the metatarsal bone, and to remove the pressure. The treatment will probably have to be continuous, at any rate, for the present generation; but if artificial distortion can be transmitted by hereditary descent, why should not artificial orthopædism?

Meanwhile, as Sir Thomas Smith has pointed out, the bursa, which has been called into existence for the express purpose of saving the joint from inflammation, often, with a

<sup>1</sup> In some cases, no doubt, gout or rheumatoid arthritis may have originated the distortion.

high sense of altruism, sacrifices itself in the attempt, and undergoes the inflammatory action from which it has saved the joint. Like many good people, however, it sometimes goes too far, showing more enthusiasm than judgment, and, by proceeding to suppuration, may not only destroy the joint but infect the system as well. Long before this happens it is the duty of the surgeon to interfere and to remove all septic material, or, if sent for in time, before the formation of pus, to promote the absorption of the fluid by appropriate treatment; the removal of pressure, the restoration of the natural position of the joint, and the application of sedative and absorbent remedies.

The treatment of corns we have already referred to. Of all methods cutting is the worst. Can anything be more unscientific, more opposed to common sense even, than to attempt to cure a corn penetrating the cutis by slicing off the outside of it—that is, the least abnormal part? For in its external layers a corn is little more than a callosity, which is almost physiological. When thus treated the pressure and friction are only transferred from the centre to the circumference. The hardened cuticle, deprived of its outer layers, is more sensitive than before, the papillæ being more exposed; the area of induration is increased, and the last state of the patient is worse than the first—that is, if the causes of friction are allowed to continue. If they are removed, the corn will disappear of itself and no cutting is necessary.<sup>1</sup>

When the corn is more deeply cut certain further structural changes ensue. Instead of the horizontal flattened layers of the thickened epidermis, we now have layers perpendicular to the surface of the skin, and covering a number of elongated and extremely sensitive papillæ with enlarged extremities. These enlarged papillæ are the result of hypertrophy of the upper surface of the corium which has been exposed to friction by removal of the hardened cuticle above. This condition is,

<sup>1</sup> I believe that in the warm, moist atmosphere of Ceylon corns are practically non-existent. Whether this is really due to the climate I am unable to say, but I understand that all indurations of the skin, including, I believe, keloid, are at least modified by it. I have no information on the point with regard to other tropical countries.



in structure, identical with a wart, and only occurs, I believe when cutting has been resorted to. (Fig. 3.)

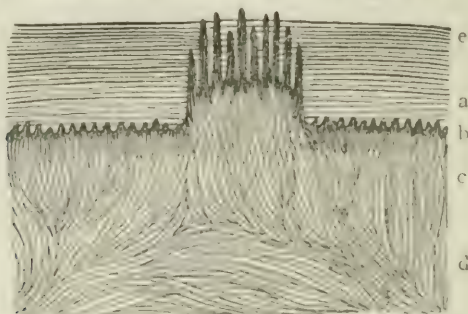


Fig. 3.—a, Cuticle; b, rete mucosum; c, corium; d, areolar subcutaneous tissue; e, abnormal development of epidermis in enlarged papillae after cutting = wart.

Another common result of this treatment is hæmorrhage, which may give rise to various further troubles. If the corn penetrates the cutis, the knife must enter the subcutaneous tissue in order to reach its apex, and in this case hæmorrhage is almost sure to follow. I doubt if ever hæmorrhage takes place in corns without cutting. It is usually slight, of course, but in view of possible sequences is obviously better avoided. In any case, if a knife has to be used, it should be with the aseptic precautions of the surgeon, and not by the empirical methods of the chiropodist. Inflammation, when it occurs, usually comes from the use of strong caustics, but it may also follow cutting. Suppuration, too, may result from either method. They rarely occur except as a result of injudicious treatment.

The prevention of corns and bunions is not, of course, our *métier*. While people wear ill-fitting boots and thin socks they will probably continue. No prophylactic serum will confer immunity, or effect a cure. If such treatment were possible, no doubt it would be largely resorted to. But the cure is too simple and too slow. Patients, like Naaman of old, want to "do some great thing," while the application of water is looked on with contempt. Even in confirmed cases, in which the removal of the pressure and friction alone is not sufficient on account of the depth and intensity of the induration, continued saturation with water will usually be all that is necessary.

The length of time it is required will depend on the severity of the disease. But this treatment may, be it remembered, in some few cases, especially of corns on the sole of the foot, involve staying in bed, or at least lying on the sofa. This is, perhaps, the chief difficulty. People will not go to bed to cure corns. If they did, they could confidently expect to get rid of them, however bad. But they prefer to wait till they are ill. An attack of typhoid, or even small-pox or scarlet fever, will cure any corn in the world. But until they get the attack they decline the treatment. And they may never get the attack. Such cases, however, are extreme and rare, so that it is seldom necessary to resort to such measures. There are, in fact, very few corns that will not succumb to a nightly bread-poultice or water dressing, with a soft perforated plaster of spongiopilin by day, to avoid friction. If the perforation can be filled with glycerine it will hasten the cure by keeping the hardened skin saturated by day as well as by night. Still, the all-night poultice or water-dressing will usually suffice, and very often much less than this. Soaking the feet night and morning in warm water, with or without the addition of some alkaline carbonate, will, in many cases, remove corns. The alkaline carbonates have a potent action on the skin. Bottle-washers, whose hands are constantly being washed in water containing sodium carbonate, have their nails softened and almost destroyed by it. The hardened cuticle of the corn may be thinned and softened in the same way. Still, after all, *ἄριστον μὲν ὕδωρ*, water is the best and safest cure, with patience added. The difference of treatment in different cases consists, not so much in the nature of the remedy, but in the length of time during which it needs to be applied. The advice given by Fergusson, some 60 or 70 years ago, was, "Poultice till they drop off." This advice suggests a true principle of treatment, an intelligent application of which will, in most cases, be successful. It is, generally speaking, only a question of time. The particular method is unimportant. The underlying principle is everything.

"Il va sans dire," though, perhaps, as Talleyrand said, "Il va mieux en le disant," that soaking is of no use without the removal of pressure as well. We have an instance of this in what are called soft corns. Here we have soaking and

pressure combined. The cuticle is swelled and softened, pressure is made in both directions by the thickened corium ; there is a greater tendency than in the other variety to the painful warty papillary growths already referred to, and at least as great a tendency to the production of bursæ. In simple cases all that should be required is the removal of pressure by cotton-wool, sometimes with the addition of some drying powder to moderate the effects of the prolonged and excessive moisture.

The painful warty growths which occur on the sole of the foot, and are, I believe, usually the result of deep cutting, are not corns, but complications. They are sometimes, however, amenable to the same treatment. If not, they will require some surgical skill, and the careful application of glacial acetic, or nitric acid, or the electric cautery. Unskilled cutting in these cases is dangerous, and may be fatal. Inflammation and suppuration are also complications which will require rest and special treatment. This rest and treatment, however, which would not otherwise have been undergone, will almost inevitably cure the corns.

This advice, of course, holds good only so long as surgery continues to be a factor in the healing art. When all warts can be cured by swallowing extract of thyroid gland, and all inflammations and suppurations by the injection of some anti-toxic serum, the bulk of the surgeon's occupation will be gone, and the physician's prophecy within a reasonable distance of fulfilment. Corns and bunions can then be treated on their individual merits, and complications be practically ignored.





FRACTURES OF THE UPPER EXTREMITY OF  
THE FEMUR, AND THEIR TREATMENT.

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FRACTURES of the neck of the femur enjoy an unenviable reputation which, to a certain extent, is justified, for it continually happens that a person who is either actually advanced in years or whose tissues are beyond his years, as the result of some trifling occurrence by falling upon the region of the great trochanter, produces a fracture of the base of the neck, or by catching his foot in some obstacle causes a twisting of the limb, and, as a consequence, a fracture occurs inside the capsule of the hip joint. Whichever happens, as the result a person who up to the time of the accident had a certain expectancy of life is laid up in bed, and, in consequence, frequently develops some congestion of the lungs which causes his death.

Again, among those patients who recover from the injury many are hopelessly crippled for the remainder of their life, in consequence of the deformity which results when impaction has taken place; while others, because of a useless limb in consequence of the failure of osseous union, similarly suffer.

It is quite certain that of the class of patients who sustain a fracture of the hip, a certain number will die in spite of all our efforts. I find that during the last five years I have seen 33 cases of fractures of the upper end of the femur, of which 5 patients died in hospital (4 in consequence of lung complications developing within two weeks of the accident and 1 from apoplexy five weeks after), while 13 were sent home at the earliest moment, as from various causes their condition precluded any surgical interference.

In the case of the remainder (15) I have endeavoured to correct deformity so far as possible, and to do what was feasible in the way of ensuring bone union; for a certain proportion of the patients with fractures in this region possess sufficient resisting power to enable them to recover the shock of the injury and to withstand the tendency to

pulmonary troubles. A great deal can be done for these patients, in the way of obtaining improvement in the relationship of the fragments to one another in those cases where impaction exists, with a corresponding prevention of lameness, etc., and in some of the cases in which there is no impaction it may be possible to obtain osseous union by surgical interference.

The injury most frequently seen in this region is the type of fracture that is variously designated as "fracture of the base of the neck of the femur," or "the intertrochanteric fracture." The really intra-capsular fracture of the neck of the femur is decidedly of less frequent occurrence. Among 33 cases seen there were only 10 intra-capsular fractures, all of which were examined by the X-rays. In cases of the fracture at the base of the neck it is very usual to have impaction with comminution, or at least a splitting up of the cancellous tissue of the trochanters, but sometimes without any loosening of the impaction. These fractures always, one may say, unite by bone, but always with deformity, unless surgical interference is undertaken to correct it. For in these cases there is invariably some degree of eversion of the limb, brought about as the result of the accident, and it is often extreme. This eversion in itself is a source of considerable crippling to a patient, for the spring of the foot is lost to a large extent, and the difficulty in progression, due to the abnormal attitude, is very great; and if, as almost always happens, there is shortening of the limb in addition, the comfort of the patient in locomotion is very seriously interfered with. Further, the usefulness of any patient who has to work for a living is enormously depreciated, for it is to be borne in mind that these fractures are not confined to old age; quite a number occur in young adults at a most important wage-earning period of their lives.

It is now many years since the question of the advisability of breaking down the impaction in these cases was raised, but it has not, to my knowledge, received general favour, yet it is the only rational method to follow.

I have carried it out, more or less completely, in all the cases of this kind which seemed capable of undergoing the necessary manipulations. If the eversion cannot be completely

got rid of, it vastly improves the patient's comfort and ease in walking if it can be diminished, and the more completely the better. Latterly, in addition to manipulation, I have applied extension to the limb, after the correction has been carried out, instead of using splints, and the results have been much more satisfactory.

The course of treatment is as follows :—

Under anæsthesia, general or spinal, the impaction is cautiously undone by abduction and internal rotation, with some flexion often at the hip joint, while the pelvis is fixed by an assistant. When the limb has been brought into fairly good position extension weights are applied, and the limb is kept in extension, well abducted at the hip joint and supported by sandbags in order to prevent recurrence of outward rotation. It is of service to have a transverse pull round the pelvis acting towards the sound side ; it prevents the patient from slipping from position, and allows the extending pull in the limb to be more effective. Where sandbags are not sufficient, one or more rotating pulls are applied to the thigh, as described in my last paper in *THE PRACTITIONER* on the treatment of fractures.

The great advantage of the extension method over the old splint method is that the patient does not require to lie constantly upon the back, but may be permitted to sit up in bed from the first, practically without interfering with treatment, for the extending weight is always in action, and the head and neck of the femur remain in position with respect to the shaft, whether the pelvis is flexed or extended on the head of the femur. By thus enabling the patient to be off the back the risk of pulmonary complications is much diminished.

It is remarkable how great an improvement follows in cases treated in this manner. The hip, knee, and ankle joints can be regularly exercised throughout the period of extension, and at the end of six weeks or so good union will probably have resulted, but it is advisable to keep up the extension for eight weeks at least. The patient ought not to try to put weight upon the limb for at least ten weeks after the injury, however good and strong the union appears to be, for all the weight of the body in the process of locomotion is transmitted to the lower limb through this bond of union between the neck and



the trochanteric region, and in a certain proportion of cases in which union has appeared to be good it will be found, after a time, that the line of the fracture is yielding, and that the head sinks down on the shaft unless this precaution is taken. In those cases in which no impaction exists, the treatment consists in extending the limb abducted at the hip joint.

In cases where nothing is done at the time immediately following upon the injury to correct existing deformity and to prevent the certain lameness that will result therefrom, I believe that it will be found to be possible to procure a very great amelioration of the patient's unfortunate condition by making a subtrochanteric osteotomy, and by inverting the limb below the point of the bone section. Although I have for a long time past had the idea of doing this, I have only once had an opportunity of putting it into practice, but the result was very gratifying.

The real intra-capsular fractures of the neck of the femur are not very common. They may be complete or incomplete, and the latter form an extremely important class of injury in young patients, more frequent, I am sure, than is often suspected; and important, because they constantly lead to the development of a coxa vara. Here, however, I am only concerned with the complete fractures. These occur almost invariably just where the head joins the neck, and are seen in young patients before the age of 20 years and in old patients, but very seldom at the intermediate time of life. In young patients they are separations of the epiphysis of the head, and both in these young patients and in old ones they are usually the result of torsional violence.

Of these genuine intra-capsular fractures it may be said that unless impaction occurs, which is rare, osseous union, by any means short of operative interference, is not to be expected in the ordinary course of events. It does most exceptionally occur, I admit, and when it does there is almost invariably some abnormal relationship between the fragments, with the result that there is interference with the normal movements of the articulation.

I have met with three instances of separation of the epiphysis of the femoral head, all of which were of some standing when first seen by me. The first two cases came

under my care within six weeks of one another. Both resulted from twisting violence applied to the limb, and in both the position assumed by the injured limb was that characteristic of a pubic dislocation of the hip joint, *i.e.*, the limb was flexed and everted at the hip and shortened.

My third case of this kind was not seen until four months after the accident, a fall from a bicycle, but from the attitude of the limb and by the X-ray plates, the diagnosis was made and confirmed at the operation. This lad is the only patient I have yet seen who had spontaneously got osseous union of the fragments after a genuine intra-capsular fracture of the femur. I opened his joint from the front, and found that the posterior portion of the fractured surface of the neck had united to the anterior part of the fractured surface of the head in such a manner that there was still a high degree of eversion of the limb, and thus the patient's disability was quite explained. I could only treat this by excising the head of the femur, for after dividing the union between the fragments it was impossible to bring the surfaces together without sacrificing so much of the neck that it seemed improbable that union could ultimately occur. I therefore thought it advisable to remove the head in order to save the neck of the bone, and to trust to early movement to establish function again. The patient recovered with a fairly useful limb and with complete relief from all his pain.

In the two other cases of epiphyseal separation that I have seen I was able to obtain close osseous union, and absolutely perfect function, by pinning the fragments, after opening the joint from the front, and, in my opinion, this ought always to be attempted before removal of the head is decided upon.

My first patient was operated upon on January 22nd, 1904, six weeks after his injury, and the second patient was operated upon in March, 1904, five weeks after his injury.

In the case of older patients with sub-capital fractures the question is rather different. It has been recommended that the head of the bone should be excised when the condition of the patient is such as to permit it, and this line of treatment has been somewhat extensively carried out. I do not feel altogether sure that it is the best. If it is possible to fix the fragments directly, by operation, I believe this ought to be attempted, but it can only be done in the case

of patients whose tissues are in really good order, and whose resisting powers are good. In three patients, aged respectively 59, 41, and 39 years, with sub-capital fracture, I tried the effect of pinning the neck and head together, the operation being carried out in these patients, as well as in the two with the epiphyseal separation mentioned above, by a small incision over the outer aspect of the trochanter, the joint being in the first instance opened from the front in order to allow the fractured surfaces to be freshened. I was surprised to find how troublesome it was to send a pin along the axis of the neck so as to strike the head in such a way as to fix it fairly square upon the end of the neck in its natural position, and should think that without any opening into the joint it must be a somewhat difficult procedure to pin the fragments satisfactorily when one's only guide is the illumination afforded by the X-rays, yet this has been recommended and practised. The slightest variation in the position of the femur as regards rotation will alter the angle of the neck on the femoral head, but if any benefit is to follow it is absolutely essential that the head and neck should be in their normal relationship to one another.

The result in these three adults who were operated on by me was that one of them got good union and a freely movable joint, while in the cases of the other two patients the neck of the bone underwent complete absorption, although the wound in each case was absolutely aseptic throughout. I have no doubt that this result was due to the trauma of the manipulations in drilling the neck with the pin. It might be preferable to fix the head to the neck by wiring; if this were done while the limb was held in complete abduction at the hip, and this position maintained throughout the time for healing, it might be possible to get osseous union without the risk of absorption of the neck, but I have not yet had any opportunity of putting this into practice. But in any case the patients must be selected for this kind of treatment. Patients who are not in the best condition, if operative treatment is desired, are not suitable for this preservative treatment; they can only be treated by removal of the head of the femur and fixation of the limb in the abducted position, so as to throw the neck into the acetabulum in order to allow fibrous union to take place.



## PELVIC PAIN APART FROM OBVIOUS LESIONS.

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It may be justly said that the female pelvis is the commonest place for all kinds and conditions of pain. Those who have charge of gynæcological departments certainly spend most of their time searching for the cause of this or that form of pain, and there is no doubt that in quite half of the cases no obvious lesion is found. In all cases the investigation should be most searching, and the more certain one becomes that no obvious lesion is present the more carefully should the search be pursued. We know how a calculus may be tucked away in the ureter, and we know how tubercle, and even new growth, may be hidden in some nook or corner. It is well to be cautious, and to examine the patient many times before saying that her pain is neurasthenic in origin. Even a gross lesion may not become obvious to an experienced bimanualist long after pain has given a warning signal. Tuberculous infection of the Fallopian tubes and pelvic peritoneum is a frequent offender.

First, take pain which bears some relation to, or is directly connected with, menstruation. There are three main types of this, viz. :—1. Pain which may come on before each period, but which reaches its maximum intensity when the flow begins (this is the so-called spasmodic dysmenorrhœa) ; 2. Pain which begins before, but which is at once relieved when, the flow is established (congestive dysmenorrhœa) ; and 3. Bilateral or unilateral pain of ovarian origin, which sometimes recurs at definite times between and at the time of the flow. With regard to congestive pre-menstrual pain it will always be found that this is due to some fairly obvious lesion, such as a retroversion, or some inflammatory condition of the uterine body or the Fallopian tubes. It is easy to see how this form of pain is a mere symptom of some inflammatory or congestive condition, because just before menstruation begins the pelvic

organs become flushed with blood ; thus any pre-existing pain is made worse ; but, as soon as the flow begins, the local circulation is depleted, and the pain becomes less in much the same way as when a leech is applied to an inflamed area.

We will therefore leave congestive pain alone, because, in most cases, a lesion will be found and should be treated accordingly.

Pain occurring at the time of the flow is real dysmenorrhœa. In by far the greater number of cases no cause for such pain will be found ; but, in a few cases, it is due to the passage of a membranous cast, or to a fibromyoma of the uterus, or even to some real obstruction of the lower genital canal. In the last case, the pain receives the name of obstructive dysmenorrhœa.

*Spasmodic Dysmenorrhœa.*—As every one knows, this form of pain varies greatly in severity, and every young girl suffers more or less at her periods, but, at times, the pain is so intense that it is hardly less severe than ureteric colic.

I have seen a young lady, who up to the age of twenty years was a strong, healthy, robust person, when, for some unknown reason, she began to have severe attacks of uterine colic at the beginning of each period, and, within six months, she became a neurotic wreck. She lost three stones in weight, and became a delicate, fragile creature, who looked forward to her next menstrual period with horror and dread. Each period lasted about five days, and there appeared to be nothing wrong with the mechanical part of the flow. She was under the care of one of the gynæcologists attached to a London hospital, and, after trying all sorts of drugs, the cervix was dilated, and the uterine mucous membrane curetted on several occasions within a year. The result was that, after the last curetting, she never menstruated again, so I suppose the frequent curetting destroyed the endometrium. The dysmenorrhœa had, of course, been cured, but hardly in the way that was expected. In a few of these cases, there may be a congenital infantile condition of the uterus, but I know of no way of being certain that such a condition is present.

The books talk of increased ante-flexion, a small uterine body, and a conical-shaped cervix as being characteristic of this condition. It is not easy to tell clinically whether any given

uterus is pathologically bent too much forward on the cervix, and in every case of spasmodic dysmenorrhœa which I have dilated the sound has passed at least three inches when traction was applied to the cervix. So that there seemed to be very little decrease in the length of the cervix and uterine body, and I have not been able to satisfy myself as to what a conical cervix really is. Dr. Herman very truly says that cervixes vary almost as much in shape in different individuals as noses do.

We know a few facts concerning spasmodic dysmenorrhœa, which are helpful in its treatment. Child-bearing and artificial dilatation of the cervix, especially the former, often cure the condition. This fact points to "spasm of the cervical muscle" as the cause of the uterine colic, and does not necessarily mean that there is some permanent obstruction present.

The pain of spasmodic dysmenorrhœa is usually most severe just as the period begins, lasting a varying time. It may be a mere supra-pubic aching, or occur in terrible spasms of pain, causing complete prostration. As time goes on, the patient, if she is not already an anæmic wreck, soon becomes one, and when it is considered that she has to face this painful condition every twenty-eight days this is not surprising. She, therefore, becomes hysterical, or otherwise neurasthenic.

Dysmenorrhœa may be severe from puberty, but it more often makes its appearance some years after menstruation is established. I think it is most common between the ages of 17 and 20 years. Another point is that after many months of uterine colic another kind of pain frequently makes its appearance in the form of ovarian aching. These mixed forms do not readily respond to artificial dilatation of the cervix.

The treatment of spasmodic dysmenorrhœa falls under two headings, (a) Medicinal, (b) Operative.

(a) In young unmarried women, ordinary hygienic treatment should be adopted with special attention to the bowels, etc. Large doses of iron in the form of pills, together with half-ounce doses of malt extract, taken after food, will be of considerable use, especially if the patient is anæmic. It is best for them to rest during the first few hours of the period, and, for the pain, aspirin in 5-grain doses seems to give



relief. Antipyrin, given in a mixture with spiritus ammon. aromat., will suit some cases. There are a great number of patent medicines recommended for dysmenorrhœa, and most of the fluid preparations contain large quantities of alcohol. This drug has a time-honoured place in our long list of remedies, and has, of course, been used for many years in the form of gin—a remedy which we, as medical men, should strongly condemn. Morphia should be avoided, if possible, but there can be little objection to giving a small dose once a month, if the pain is intense. One would give it for renal colic, so why not for uterine colic which may be as bad?

There is not often any necessity to examine these young virgins, because the pain is, as a rule, very characteristic. If the pain is prolonged up to the end of each period, it is well to be sure that there is not some congenital obstruction present. I remember a case, in which the menstrual flow was of normal duration and amount, and was accompanied with severe pain, which seemed to reach its maximum intensity toward the end of each period. This was eventually found to be due to a uterus bicornis, one horn of which was open to the single cervical canal, and the other was closed. The menstrual blood collected in the closed horn, and formed a tumour, which later became adherent to the back of the umbilicus, through which it emptied itself at every menstrual period. This unilateral hæmato-metra was removed by Dr. Galabin. It is perhaps wise to advise an examination in certain cases.

I know how disappointing is the medicinal treatment of many cases of spasmodic dysmenorrhœa, but it is always as well to ring the changes on the many remedies at our disposal, because, sooner or later, most of these cases get well, and one should fortify these young neurotic subjects with this hope. The better-class patients do well if they are sent to winter in a warm, sunny climate.

(b) With regard to the operative treatment, simple dilatation of the cervix is practically the only one worth considering. I have seen this simple operation act like a charm, and I have, on many occasions, seen it absolutely fail to do the least bit of good. Before advising dilatation, the character of the pain should be carefully considered, for when the pain is purely of a

uterine colicky nature, dilatation will more often succeed than when it is of a continuous, dull, aching type, or if ovarian pain has become added to the uterine pain, as is often the case when the dysmenorrhœa has lasted for some time. I do not think that any hard-and-fast rules can be laid down as to choice of cases for dilatation, but it is always well to warn the parents that the operation may fail to relieve. I will not discuss the details of dilatation of the cervix, but although it is a simple operation, it is not free from danger. In the first place, when the cervix is pulled down, the cervical canal does not straighten out in a virgin uterus as in a parous one, so that, when the dilators are thrust along the cervical canal, the point hits the posterior wall of the uterus, and will cause some injury, and may possibly perforate it. It is, therefore, best to cut the cervix behind in the middle line as high as the posterior fornix. By this means the dilators can be passed more in the direction of the axis of the uterine cavity. The dilatation should not be hurried, lest the cervix be severely lacerated. I know of a case in which the right uterine artery was torn during a simple dilatation of the cervix with Hegar's dilators. I do not think it necessary to carry the dilatation further than a No. 10 or 12.

Many curette the uterus at the same time, but this should not be done, unless there is some definite evidence that the endometrium is diseased. Sometimes a second dilatation may be tried, but multiple curettings will merely end in some uterine infection, and will only do more harm than good.

Apart from dilatation of the cervix, there is no other form of operative interference which is justifiable. If any case defies all other treatment, it may be perhaps justifiable to remove the uterus, but I have never seen a case which would warrant this extreme measure for this condition. Some time ago, I made an attempt to find out how many patients, suffering from spasmodic dysmenorrhœa, benefited from dilatation. Many of those who answered had become married, and seemed to have forgotten that they had ever suffered from dysmenorrhœa, and others wrote complicated accounts of the various things that had befallen them in the meantime, so that it was impossible to form a trustworthy conclusion. It seemed that

about 50 per cent. were better after their operation.

There are many subjects of spasmodic dysmenorrhœa who, on becoming married, are sterile. Some of these get pregnant after dilatation of the cervix and curetting of the uterus. In others, dilatation does not lead to fertility. If the menstrual periods have always been scanty, there is probably some ovarian deficiency, and dilatation will do no good. Many of these cases are examples of infantile uterus, and one can only comfort them by saying that their pain will most likely tend to lessen as they become older. Nevertheless it is always worth while to dilate the cervix and curette the uterus in these cases.

*Ovarian Pain.*—It is extremely difficult to give a concise clinical account of ovarian pain, apart from obvious lesions, because hardly two cases are alike, and one has only to turn to the text-book accounts to become utterly bewildered by the disjointed descriptions given, and to wonder at the hopeless attempts to make *anything* out of the pathology of this subject. In attempting some sort of clinical classification I think the following types of ovarian pain may be recognisable:—(a) An acute form, which bears no relation to menstruation; (b) an acute form, which makes its appearance at regular intervals, say, eight or nine days before each period; and (c) a dull, aching in one or both iliac fossæ. Often the acute attacks of pain are followed by the continuous aching, but there is a distinct clinical difference between the sharp neuralgic type of pain and the dull, wearying variety, which is common among pale, melancholic, and atonic-looking women.

The acute varieties go together, but it is distinctly rare for the pain to recur at a very definite time before each period, and in my experience the neuralgic type, as a rule, has little connection with the menstrual flow.

Not long ago I saw a patient who could tell almost to the hour at which her next period would commence, because for seven and a half days before each period she suffered from severe pain in her right ovary. She had been married four years, but was sterile. I found a small unilocular ovarian cyst of about the size of an orange, which I was able to remove, and to leave the greater part of the ovary behind.

In this case there was, of course, a definite lesion, but in two other cases, which I have seen, there was none.



Acute ovarian pain comes on suddenly, and is more common between the ages of 25 and 35 years. The patients may be single but more often are married, and, if married, are frequently sterile. At the commencement it is usually unilateral, and more frequently right-sided. After a few months the pain may get better on the original side, only to begin on the other. The acute attack passes off, and, as a rule, leaves a more or less chronic aching behind. Recurrence of the pain is the rule, and thus this condition simulates appendicitis. Patients suffering from ovarian pain become quickly neurasthenic, and present a weary facial expression, which is very characteristic, with darkened rims around the eyes.

As said above, this type of pain may be mistaken for appendicular colic, and indeed it is sometimes a matter of great difficulty to distinguish the one from the other. Most of us have known of cases operated upon for supposed appendicitis, and when the abdomen was opened the appendix has been found to be quite normal. The surgeon, putting his hand into the pelvis, discovers an ovary, and says: "Here is the mischief, this is a case of cystic degeneration of the ovary." He removes the offending organ, containing a few little cysts, which in fact has nothing pathological about it, and, unless the moral effect of the operation renders the patient happier, the removal of the ovary will almost certainly not remove her pain. Ovarian pain should be distinguished from appendicular colic, if possible, because operation for the former should be avoided, while for the latter the sooner it is done the better.

The chief points which distinguish ovarian pain from appendicular colic are (1) the general aspect of the patient, and (2) the position of the pain, which in ovarian pain is confined more to the inguinal region, and is accompanied with less abdominal rigidity than appendicular pain. On vaginal examination, the tenderness in ovarian trouble is usually behind the uterus to one side or the other, while the appendix, if it gets into the pelvis, generally prefers the peritoneal pouch between the bladder and the uterus. Again, it may be possible to feel a slightly enlarged and tender ovary through Douglas's pouch, which may help in forming an opinion; and, lastly, the pain may be latent. When put to a

case, it is far easier to say whether the patient has ovarian pain or not than to write it on paper, because so much depends upon instinct, and the general look of things. The following case is a good example of the difficulties in distinguishing ovarian pain from that caused by an ureteric calculus.

A young married woman complained of severe pain in the left iliac fossa, which most often came on six days before each menstrual period, but sometimes he would be free from pain for two or three months. She had noticed the pain for about eight months when she sought advice for it.

She was admitted into hospital, and, after a careful examination, the pain was thought to be ovarian. She went home after a two weeks' stay in hospital, during which time the urine was examined on several occasions, and found to be normal. Six months later the patient was admitted into my ward, as a case of ovarian pain, but her general appearance and the absence of neurotic symptoms, coupled with the facts that the left ovary could be felt and was not tender, and that the pain was rather higher up in the iliac fossa than is usual with ovarian pain, led me to conclude that there might be some other cause. I should mention that there was slight frequency of micturition, both during and after each attack of colic, but beyond a trace of albumen the urine was normal. The skiagraph showed a fairly big stone in the left ureter at about the level of the sacro-iliac joint, which was successfully removed.

The pathology of ovarian neuralgia is not known, but it should be clearly understood that there may be some gross lesion present which will need suitable treatment. I am confining myself to that class of case in which the uterus is in good position, and the ovaries are freely movable with perhaps some enlargement of one or both of these organs. There is absolutely no microscopical evidence that these organs are diseased. There may be some enlargement, but normal ovaries vary greatly both in size and shape. There may be small cysts present, but many ovaries contain small cysts and no pain is caused. There may be apparent thickening of the tunica albuginea, which cannot be proved to be pathological. Cirrhosis and sclerosis are two more favourite terms, but I do not believe such diseases exist apart from ascending infection

from the lower genital passages or from neighbouring viscera ; conditions, in fact, which are quite secondary to the primary lesion, and completely overshadowed by it. It may be said that the cause of acute and chronic ovarian neuralgia is pathologically unknown, *and I am quite sure that, if one had twenty pairs of ovaries free from adhesions on a plate with microscopical sections of each, no pathologist in the world would be able to say which of them had given rise to pain and which had not.*

Chronic ovarian aching is frequently associated with other pelvic lesions, and most often with retroversion of the uterus, which, when it falls back, carries the ovaries with it, and when replaced, *does* sometimes relieve the ovarian distress. Anyway, it is always worth while to replace any co-existing displacement of the uterus, and to keep it in its proper place with a pessary, or by means of a suspension operation *other* than a hysteropexy. Chronic ovarian aching is also frequent, when there has been some past infection of the uterus, and even though in some cases there may be no obvious evidence of the presence of old tubal and peritoneal affection, the history of a septic abortion, or labour followed by a long period of sterility, will suggest some chronic tubo-ovarian infection. Such cases should always be examined, if possible, under an anæsthetic, when the mobility of the ovaries and uterus can be more certainly tested. I have never seen the intense neuralgic form of ovarian pain associated with real infective lesions of the tubes and ovaries, but chronic ovarian aching is common. If a young girl complains of persistent pelvic pain, which may become worse before each menstrual period, and is possibly associated with an increase in the menstrual flow, and some vaginal discharge is present, it is wise to keep the question of early tubercle of the Fallopian tubes in mind. I remember a young unmarried girl, aged 18 years, who came complaining of a constant pain in both inguinal regions and in her back. Nothing abnormal could be detected. She had noticed the pain for about four months. She became worse, and six months later both Fallopian tubes had become converted into cystic banana-shaped tumours which were quite free from peritoneal adhesions. The microscopical sections showed tuberculous giant cells.

I am certain that sometimes ovarian pain is a pure neurosis, and I have lately had a case in point. A married woman, the mother of two children, was admitted under my care suffering



from great pain in the left ovarian region. She had been ill for about six months, and her medical attendant had tried all kinds of remedies. She was thin, and whether in bed or up she had severe attacks of pain. Under an anæsthetic I could find nothing to account for her condition, but subsequently I noticed that I could alter the site of her pain by suggesting that it was in the renal region and so forth. We thought her case to be one of pure neurosis, and, after having her under observation for three weeks, she was sent home. She came back again in a most dilapidated state. She had wasted rapidly, and I was greatly shocked at her condition. Her pain seemed so severe that the house surgeon, on several occasions, was forced to give her morphia. After much hesitation I opened her abdomen and found absolutely nothing wrong. After the operation the patient put on weight, and improved in general health in a wonderful manner, and I often think what a chance Christian Science missed in this case.

With regard to treatment, the first thing to do is to get hold of your patient and to persuade her that she will get well, but that it may be some time. Stick to her as long as possible, but do not be disappointed if she goes to someone else for advice. If she can afford it, send her away to Egypt or to some spa where she may have mud baths, massage and various forms of electric treatment. Try everything, for anything may catch her at the right moment and apparently cure, or at least relieve, her. Arsenic and iron will help her general condition, and aspirin and bromides within reason will relieve the pain. *Avoid morphia.* Ovarian or lutein extract seems to have some beneficial effect on some, but these are expensive drugs. Thyroid extract helps in some cases and may be given a trial. Ring the changes on rest cures and massage, etc. The most acute types are more readily dealt with, because the patients can be put to bed and treated like any other form of acute neuralgia, and, as a rule, the acuter the pain, the sooner will the attack pass off. There is one other point I should like to mention, and that is that many of these patients are married women who are sterile, and whose sterility is due to prevention of conception, and it is as well to warn them against this practice, and to prescribe as much sexual rest as possible to all married women with chronic pain.

*What of Oöphorectomy?*—In my opinion there never was an

operation which has been practised in the past with a greater disregard to the physiological functions of the organ than oöphorectomy. There are a few cases in which unilateral oöphorectomy seems to be the only hope of stirring up the last ray of moral pluck in a patient tormented with chronic ovarian pain, but the removal of the organ will most often give no relief to the patient, because the pain may not only remain on the same side, but often pass over to the other ovary. I admit that there are some cases of ovarian pain which will benefit by removal of one ovary, but, in view of the important physiological functions of this organ and the uncertainty that its removal will relieve the pain, it is an operation which should only be undertaken when everything else has failed, and only on the understanding that it is done as much for the moral effect of it as for a surgical cure.

Of double oöphorectomy I have little to say, because it is an operation which has no place in modern surgery.

Even in cases in which there is a gross lesion I always make an attempt to save a piece of an ovary simply for its physiological value in the future. In each case of the last five pyosalpinxes which I have removed, one ovary was a mere bag of pus, and, of course, had to come away, but I have saved the whole or a bit of the other ovary, with the result that these patients have menstruated normally since the operation, and have not suffered from a distressing artificial menopause.

*To remove ovaries affected with new growth or real infection is quite a different thing from the removal of apparently normal organs for pain ; moreover, when an ovary is attacked with a gross destructive lesion, such as new growth or real septic infection, the removal of these organs does not, as a rule, cause the distressing menopause symptoms which are so common after double oöphorectomy for pain.*

In explanation of this it is only reasonable to suppose that a real destructive lesion gradually hinders the functional activity of the ovary, so that, by the time that these diseased organs are removed, they have already lost a considerable amount of their physiological powers. I am convinced that the ovaries in these cases of neuralgic pain are in a hyper-functional state, and that this is the reason why women suffer

so much, mentally and otherwise, after double oöphorectomy for this condition.

I hope I have made it clear that double oöphorectomy is nowadays an obsolete operation. The ovaries are two complex organs which govern and control a woman's physiological economy to a far greater extent than seems to have been recognised by the surgeons of the past. The ovaries are not merely concerned with ovulation; they exercise other forms of physiological functions. I believe that most cases of ovarian pain do get well. Some of the more acute cases quickly mend, while I know that a few do not get permanent relief until a natural menopause renders both the uterus and ovaries afunctional. I do not believe there is in the whole range of medicine and surgery a more difficult class of case to deal with than is this one of chronic ovarian pain with its associated mental symptoms and various forms of neuroses.

I have, on several occasions, seen intense ovarian pain associated with early pregnancy, and one or two in which the pain followed the birth of a first child. One patient was a woman, aged 40 years, who had had several children, and again became pregnant after ten years of sterility. The pain began on the left side at the third month of pregnancy. I could find nothing abnormal about the pregnancy, and there was neither pus nor blood present in the urine. The pain gradually became less as the pregnancy advanced, and had completely disappeared by the seventh month.

The next and last form of pelvic pain which I wish to mention is "sacro-coccygeal pain." This form of backache varies greatly in type and severity, and I do not wish to dwell on those common forms of backache which are due to displaced viscera and to weakness of muscles and ligaments. This kind of backache is more common in the lumbo-sacral region, and is always made worse by prolonged exercise, or a hard day's washing. I wish to refer more especially to the severe neuralgic kind of pain which is common in the sacral region. In fact, one may say that this region is the hunting ground of most of the referred pains due to serious diseases of the pelvic organs, and it is particularly unfortunate that it may also be due to a pure neurosis. It is easy to see why gross lesions of the pelvic organs so often pick out the sacral region



as the area in which to demonstrate their pain, for the position of the sacral plexus at the back and side of the pelvis and its close relationship to bone and bony foramina renders these nerves very liable to pressure from tumours within the pelvic cavity. Again, these big nerve trunks lie in the path of the lymphatics, and any infiltration of these vessels, whether with growth or with inflammatory products, will at once implicate one or more of the nerve trunks, and give rise to a more distant pain.

All these cases should be most carefully overhauled, and an examination insisted upon, regardless of age and social standing. I know of a young unmarried woman, who complained of severe backache, who was treated for many months for so-called coccygodynia, but later a carcinoma of the rectum was discovered. It will be found that most of the cases in which the pain is referred from some gross pelvic lesion will not be of a simple sacro-coccygeal type. That is to say, some of the nerve trunks passing to the leg will be affected. Thus pressure from a tumour, or infiltration by growth, will give rise to pain along one or more of the nerve trunks passing down the leg. Now, if the pain is a neurosis, it is more often confined to the sacro-coccygeal area.

In true coccygodynia there may be a definite cause present, although it may not be obvious, but, at times, I am convinced that this distressing condition is a mere neurosis. I have seen this obscure complaint present in young unmarried women in its most distressing form without any apparent lesion being present, but I think that it is far more common among women who have borne children, the pain making its appearance at about the time of the menopause, at a time when all kinds of insanity from lesions of the body may occur. On the other hand, I have lately had two cases in which the pain came on directly after the birth of a child.

One woman had, with the aid of forceps, been delivered of a large child, the presentation being an unreduced occipito-posterior. No doubt in the cases which follow immediately after labour there is some form of injury to the sacro-coccygeal joint, but it is difficult to determine exactly what this injury is. All I know is that if one finger is placed in the rectum and another on the back of the coccyx any attempt to move the bone upon the sacrum gives rise to great pain. If the

pain has followed a recent labour the prognosis is good. One of the patients, mentioned above, made herself a horseshoe-shaped pad, which kept the coccyx from pressure while sitting, which, together with some potassium iodide, given internally, effected a cure.

We must not forget that sometimes rheumatic and gouty causes may be present, and that the urine should be examined very carefully for sugar. One patient, whom I was told about, who suffered from bilateral sciatica and severe sacral pain, died from diabetic coma within a few months of the onset of the pain.

The possibility of necrosis must not be forgotten ; but I do not think that necrosis, which is very rare, will often give rise to the terrible neuralgic type of pain from which these patients suffer.

With regard to treatment, if there is a traumatic cause the joint should be kept at rest as much as possible, the motion should be soft, and I have great faith in potassium iodide as the best drug to cause absorption of any effusion or inflammatory products that may be present.

For the relief of the pain aspirin is the drug that stands in the front rank, but any of the pain-killing drugs, other than morphia, might be tried. Even colchicum may help. Locally a counter-irritant should be applied, and in the purely neurotic variety local electric baths, which can be applied so easily, may have a beneficial effect. Failing these measures, the actual cautery applied over the sacral foramina will frequently bring about a complete cessation of the trouble.

Some cases defy all attempts at the mere palliative forms of treatment, so it becomes a question as to whether some further surgical treatment is not advisable. Professor Howard Kelly says at this stage : " Here surgery steps in as a boon." I am not so sure that it does, and I have in many cases known that the removal of the coccyx has done absolutely no good. Kelly quotes a few cases in which immediate relief was obtained after removal of the coccyx, so I suppose we must accept this as meaning that a few cases may be thus relieved.

Division of the posterior branches of the sacral and coccygeal nerves might also do as much good, for who knows whether it is the moral effect of the operation or the actual removal of the bone which cures the pain ?

## THE OPERATIVE TECHNIC OF PILES.

By JAS. H. NICOLL, M.B., C.M.,

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[With Plates VIII.—XI.]

THAN the treatment of piles few fields of surgery have been more prolific of "methods" of operating, and of special instruments. In common with many surgeons, I possess, and have used, a not inconsiderable collection of clamps, forceps, special needles and cauteries; and also, in common with others, I now deal with piles with the aid of a pair of scissors, an ordinary needle and suture, and a few pairs of pressure forceps. The illustrations, drawn for me by Mr. Kirkpatrick Maxwell, of Glasgow, are so clear as to obviate the necessity for detailed descriptions.

*External Piles.*—"Cutaneous" Piles (whether purely such, or partly vascular) are excised by scissors, and the skin edges of the base are united by sutures. The wound is made in a direction radiating from the centre of the anus, and the suture used is a fine silkworm gut. *Thrombosed Piles*, after incision, and expulsion of the clot, may be similarly sutured with advantage in rapidity of healing.

*Internal Piles.*—There are in practice three types of case to be dealt with :—(a) The isolated and pedunculated pile. For this, excision, after the pedicle has been transfixed and secured by a *ligature*, answers well. (b) The circle of piles studded on a prolapsed ring of rectal mucous membrane. For this, *Whitehead's operation* suits admirably. (c) The circle of piles (purely internal, or intero-external), without rectal prolapse—the most common case, in my experience. For this case, the *suture operation* appears to me to offer advantages in the way of security against hæmorrhage and of rapidity of healing which no other method possesses. As held by both students and colleagues I am familiar with the opinion that Whitehead's operation and the suture operation are difficult, tedious procedures, the former attended by considerable loss of blood. Nothing could be further from the facts, provided the operator



eliminates all "special" instruments, and relies on his fingers.

*Whithead's Operation.*—This operation I perform as follows:—With the forefingers dilate the anus. With an ordinary hypodermic syringe introduce adrenalin chloride solution into the subcutaneous tissue. (Two punctures only are necessary. By manipulating the syringe, as indicated in Fig. 1, and reintroducing it at the spot marked  $\times$  on the other side of the anus, the solution is readily placed all round the bowel.) With scissors cut through the mucous membrane, where it joins the skin, round the circumference of the anus. With scissors and finger separate mucous and submucous coats from muscular coat for at least one inch above the anal margin. Where a vessel bleeds apply pressure forceps, and make use of these as tractors in bringing down and spreading out the "sleeve" of pile-bearing mucous and submucous coats. With scissors bisect the "sleeve," the incisions being placed anteriorly and posteriorly. Fix the upper angle of each of these incisions to the skin margin of the anus by a single suture (Fig. 2, anterior suture tied, posterior ready for tying). With scissors cut away the right or left half of the "sleeve," at the level of the fixation sutures; and by a continuous suture (begun posteriorly and finished anteriorly), unite the cut edge of the mucous coat with the cut margin of the anus. Deal similarly with the other half. (To avoid a tendency to retraction of the mucous coat after the "sleeve" has been cut away, when such tendency is present, cut part of the distance round the semicircle only, secure that by continuous suture to the anal margin, cut the rest of the distance, and resume and complete the suture.) Rarely is any vessel ligated. Place the stout rubber drainage tube (with surrounding iodoform gauze smeared with some emolient) in the rectum, and secure it by a small catch-pin passed through the silkworm sutures (Fig. 3).

The effect of the adrenalin, the use of a continuous suture, and the pressure of the tube all combine to prevent hæmorrhage, and ligatures are unnecessary. The iodoform gauze round the tube acts as a protective antiseptic dressing for the suture line, during the two or three days it is left in position. The suture used is chromicised catgut, which is left to absorb or come away. Rest in bed may extend to ten, but is often reduced to five, even to four, days.

*The Suture Operation.*—The suture operation I employ is

PLATE VIII.



Fig. 1.—Introduction of adrenalin chloride solution. By manipulating the syringe as indicated, and repeating that at the spot indicated on the opposite side, the solution is made to permeate the submucous and subcutaneous tissue round the entire circumference of the bowel.

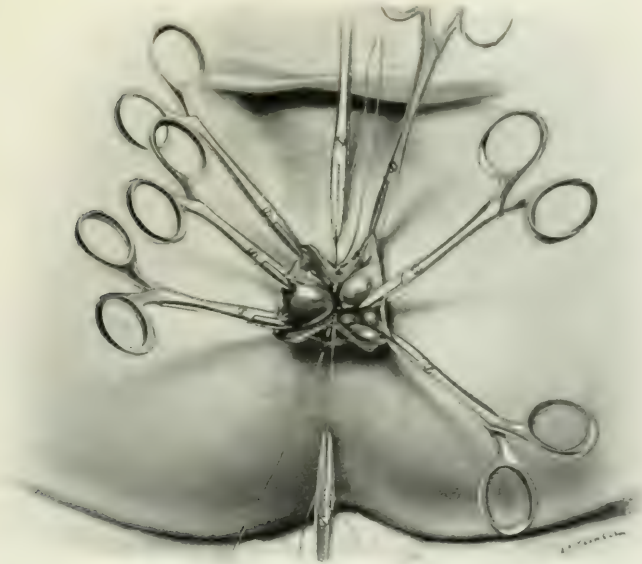


Fig. 2.—Fixation sutures placed at the extremities of the anterior and posterior incisions to secure the bisected "sleeve" of bowel before its right and left halves are cut away.

PLATE IX.



Fig. 3.—Catchpin and sutures securing rubber rectal tube.

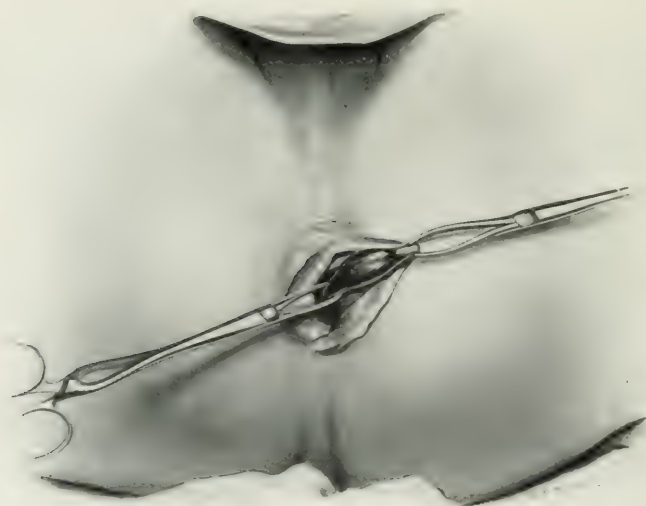


Fig. 4.—Suture operation. Pile secured by two pairs of forceps.



PLATE X.

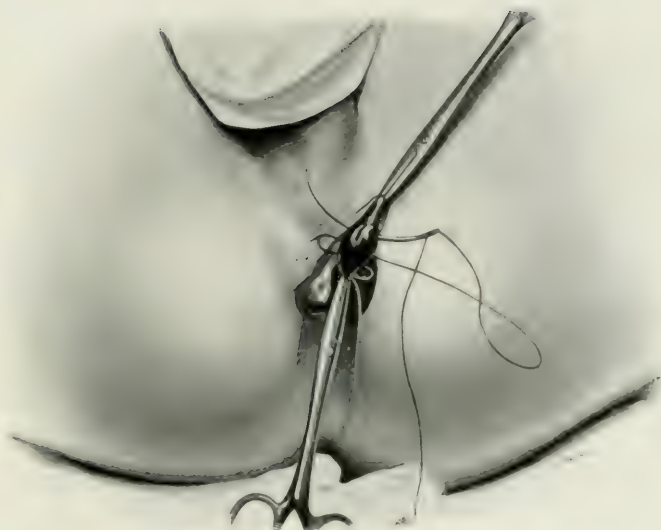


Fig. 5.—*Suture operation. First or "hamostatic" suture.*

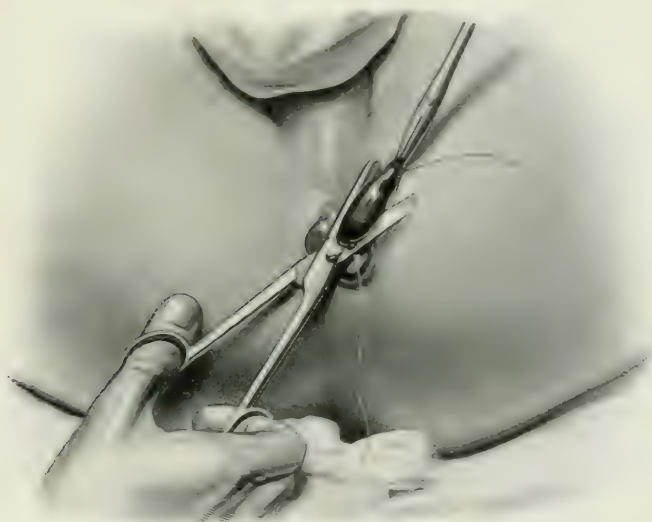


Fig. 6.—*Suture operation. Removal of pile distal to line of hamostatic suture.*

PLATE XI.

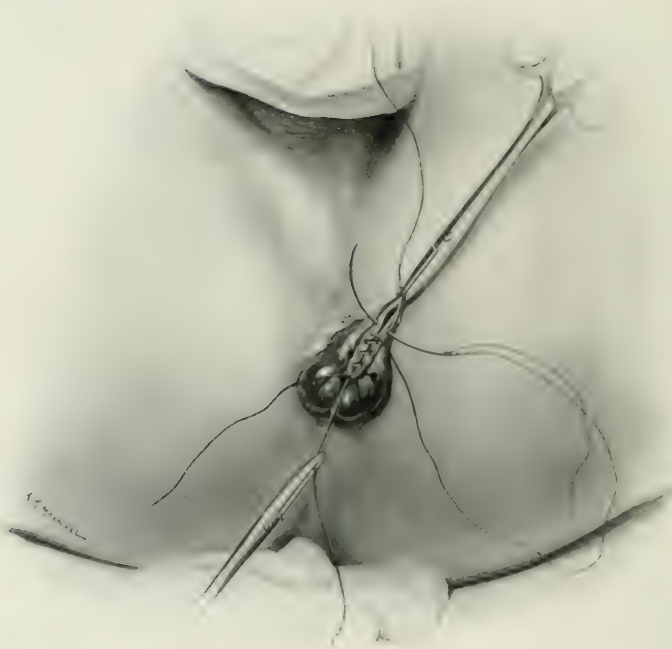


Fig. 7.-- Suture operation. *Second, or approximation, suture.*

the following:—Dilate the anus with the forefingers, and secure the piles in turn between two pairs of forceps (Fig. 4). (Any form of forceps of suitable size may be employed—stomach clip forceps, as in Fig. 4—pressure forceps as in Fig. 5—or ordinary artery forceps. The forceps are applied to the upper and lower ends of the pile, which is thus extended in the longitudinal axis of the bowel.) Carry a continuous suture through and through the base of the pile (Fig. 5), and knot it securely at upper and lower ends (Fig. 6). (This suture is “hæmostatic” in effect, and should be drawn sufficiently tightly to slightly strangle the pile.) With a second continuous suture (Fig. 7) unite the margins of the incision. (The suture commonly used is Lister’s green chromicised catgut (No. 1), which has been soaked for some hours in 5 per cent. aqueous solution of carbolic acid, or boiled in alcohol, and stored in 5 per cent. solution of carbolic acid in methylated spirit. It is of importance to note that that particular suture stands, in rapidity of disappearance by absorption or otherwise, somewhere near the middle of a scale bounded at one end by suture silk, and at the other by “plain-boiled” catgut which has not been chromicised or otherwise “hardened.”) When all the piles have been similarly dealt with, a suppository of morphia, and one of iodoform are placed in the bowel and a perineal pad and bandage are applied. The iodoform suppository may be repeated daily.

The first line of suture checks hæmorrhage, the second accurately closes the wound and secures speedy healing. (One suture may be made to suffice. Begun at the upper end of the pile, it traverses the base, is securely knotted at the lower end, and, after excision of the pile, returns, as the superficial line of approximation suture, to the starting point to be tied to its own tail, left long for that purpose.) The needle used is an intestinal one in the case of purely internal piles. In the case of intero-external piles this does not easily penetrate the skin-covered portion, and an ordinary surgical needle is preferable. The resulting cicatrices lie in the long axis of the bowel. There is, consequently, no tendency to stricture. Rest in bed may extend to eight, or be reduced to three or four, days, the patient getting up after the action of the first dose of laxative. In certain cases the patient is treated as an outpatient, and is not confined to bed.



USEFUL POINTS IN CONNECTION WITH  
DISEASES OF THE EAR.

By MACLEOD YEARSLEY, F.R.C.S.,

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THE removal of *cerumen* from the external ear should not be attended with much difficulty, yet one not infrequently sees cases, in which plugs have become forced further into the meatus by unskilful syringing. It should be remembered that the stream should be directed above, or to one side of the wax, in order that the fluid may pass along the plug and wash it out from behind; gentle loosening, by means of a probe or wire loop, will greatly help to effect this. When a plug requires softening this can generally be effected by the instillation of a warm, weak alkaline solution on two or three successive nights before syringing. When it is advisable to get this softening done immediately there are two methods at disposal. The safer is to make the patient lie down, and to instil cold peroxide of hydrogen for from 15 to 20 minutes, followed by syringing. The second method is by dropping six or eight drops of ether into the ear, allowing it to remain for about one minute and then syringing. As, however, the dropping of ether on to the tympanic membrane causes pain, it is important to be sure that there is a plug of wax present, an item which, by the way, should always be attended to before using the syringe at all.

When cerumen has been removed, the meatus should be dried with a wool-armed probe, and lightly plugged with wool for a few hours.

A few words as to *foreign bodies* may be useful. The chief points to be remembered are:—Always make sure that one is present before starting to remove it; always bear in mind that there is very rarely any need for hurry; always rely upon careful syringing except in the instances to be presently enumerated; and never use instruments unless you are perfectly well able to see what you are doing. The use of the

syringe is to be avoided when there is a large perforation and a small body which might be washed through it into the tympanum ; when syringing causes vertigo ; when the body is sharp-pointed and likely to be made to wound the membrane easily ; and in the case of bodies which quickly absorb moisture (as peas, beans, bread, wool, sponge, etc.). Round, smooth bodies, such as pebbles, which fit the meatus and give no hold, can often be removed by fastening a brush or short stick to them with some such glue as "seccotine," waiting until it sets and then making traction. Insects may be floated out with warm oil or water, or syringed out. They are best killed first by instillation of spirit, perchloride of mercury solution, or stupefied by chloroform vapour.

The formation of boils in the meatus (*aural furunculosis*) is an exceedingly painful affection. Its onset is frequently heralded by itching, and, if this is remembered, its course may sometimes be cut short. Boils often give rise to considerable constitutional disturbance, requiring the use of sedatives. The swelling of the meatus is sometimes very great, even making the pinna prominent, and, with the pain and general disturbance, simulating mastoid trouble. A valuable diagnostic point in distinguishing true mastoid swelling from swelling due to meatal inflammation is that in the latter the retro-auricular furrow is always obliterated, in the former never. One need not enter here into the treatment of aural furunculosis, save to say that the *complete* purification of the meatus is an absolute necessity, and should be continued for at least a week after all symptoms have abated. As is well known, aural furuncles come in crops, due to fresh inoculation with staphylococci ; hence the necessity for purification. Careful inspection of the meatus in such cases will very frequently reveal the presence of cerumen, accumulations of dead skin, etc., which form a natural culture ground for the micro-organisms, and which *must* be removed before the case will get well.

*Middle Ear.*—*Acute middle-ear inflammations* nearly always owe their origin to an acute catarrh of the upper air-passages, including those that are due to scarlet fever, measles, or other exanthem. In children by far their most frequent cause is adenoids. The question frequently arises in these cases as to whether the adenoids should be removed at once or the

subsidence of the acuteness of the aural complication awaited. I am sure that the latter course is the right one to pursue. The acuteness of the ear symptoms is contemporary with the acuteness of the nasal and naso-pharyngeal inflammation, and to remove the adenoid mass when it is acutely inflamed is to risk possible serious toxæmia. It is much better to treat the ear by appropriate measures, and then, in five or ten days' time, to remove the adenoids when things have settled down.

The most prominent symptom in these cases is pain. I do not intend to discuss their complete symptomatology and course, as that is to be found in any good text-book of otology. This pain may vary from the slight aching, due to attacks of tympanic congestion, to the agony of a bulging membrane. Only those who have personally experienced severe earache can gauge its severity. Slight congestive aching can often be relieved by putting a few drops of chloroform into a small cup (an egg-cup does very well), and inclining the affected ear over it so that the vapour enters the meatus. When it is severe, and inspection shows the membrane to be congested, *but not bulging*, dry heat gives most relief, but the best of all treatment is to apply leeches. From two to six leeches, applied over the mastoid, with one just in front of the tragus, will often cut short an attack. General treatment, such as confinement to one room, or even to bed, and a smart saline purge, should be carried out in every case. When the membrane is bulging, it should be promptly incised. A bulging drumhead should not be allowed to continue in that condition one moment longer than is necessary. It is a question of tension that must be relieved, and, since wounds of the membrane heal with remarkable rapidity, it is far better to incise unnecessarily than not at all. These points in the treatment of acute middle-ear inflammation, together with attention to the condition of the upper air-passages, are the most important. One thing to remember *not to do* is to poultice. Poultices are nasty, septic things at the best of times, and the person who poultices the ear runs a risk of acute perichondritis of the auricle.

One other thing to be noted is that acute middle-ear inflammation in young children may simulate meningitis, so that in all such cases routine examination of the ear is of



paramount importance.

*Acute middle-ear suppuration* next requires mention. It must be remembered that it is not always possible to say whether an attack of acute middle-ear inflammation will eventuate in suppuration or not ; any prognosis should, therefore, be a very guarded one. Some guide may be found in the temperature, the severity of the constitutional disturbance and the situation and amount of congestion of the membrane. When there is marked congestion of Shrapnell's membrane and the superior posterior segment, with early bulging (especially with a yellowish reflex) suppuration is likely. Hence, early incision is imperative. This incision should be free ; mere puncture is not enough.

As regards inflation in acute otitis media, it should never be employed when the symptoms are at their height or when pain is marked, but when the attack is subsiding it may be used cautiously and gently. The catheter is always the method to be preferred, for reasons to be given later. When suppuration is present or suspected inflation should never be practised, as there is a decided danger of forcing pus into the aditus or antrum ; nor should inflation be employed unless the nasal passages are clean.

Much has been written as to the diagnosis of *acute mastoid* trouble, and the general practitioner is often greatly in doubt as to when it is present, or upon what symptoms his judgment should be based. The symptoms due to acute mastoid suppuration are pain in the mastoid, increased on pressure and percussion, and headache. Temperature may range between  $99^{\circ}$  and  $103^{\circ}$  F., or even  $105^{\circ}$ , but is a most illusive guide. My experience is that in adults the temperature after perforation of the membrane has occurred in acute middle-ear suppuration, is seldom more than  $99^{\circ}$  to  $100^{\circ}$ , even when the mastoid is seriously affected. Influenzal cases often have a persistently subnormal temperature. The symptom to be most relied upon is pain on pressure ; and in ascertaining its presence or absence, pressure should be made with the thumb, with gradually increasing firmness, over the site of the antrum, whilst the patient's eye is watched. If there is the least tenderness, it will be shown by involuntary closing of the eyelids. Another important sign is bulging or sagging of the superior posterior

meatal wall (regarded by many as pathognomonic of mastoid involvement). The two signs occurring together are highly indicative of mastoid empyema. As regards the indications for operation, I think the following seven will cover the whole range of cases :—

1. Mastoid swelling, with tenderness on pressure, and fever.

2. Persistent tenderness, even after the subsidence of acute symptoms, a most suggestive symptom, and one on which much reliance may be placed.

3. Superior posterior meatal bulging.

4. Continuance of discharge, mastoid pain, and fever, after abortive treatment has been attempted. (Such abortive treatment consists in free incision of the membrane, prolonged into the meatal roof, hot antiseptic irrigation, the local application of heat, and the local abstraction of blood by means of leeches. If this brings about no amelioration of symptoms in 24 hours, it is useless and even harmful to continue it.)

5. The occurrence of chills, nausea, and meningeal irritation.

6. The presence of streptococci in the pus.

7. When a simple blood-count demonstrates the presence of leucocytosis, and the polymorphonuclear percentage is above normal.

A few words are necessary as to the so-called "influenzal" mastoid. It has been suggested that, the influenzal bacillus being a non-pyogenic organism, there is no such thing as an influenzal empyema of the mastoid. As a matter of fact, the kind of mastoid usually attacked in influenza is the pneumatic variety, in which the cells are large, numerous, and communicate by small openings. Pain is severe, pus formation rapid, and destruction quickly extensive. The specific bacillus may not be pyogenic, but it probably acts here as it does in influenzal pneumonia, causing fibrinous exudation, and rapidly raising the tension in the bony cells, lessening the vitality of their lining membrane, and so allowing suppurative organisms to obtain a ready hold. Pathologically the term "influenzal mastoid" may be incorrect, but, clinically, such cases undeniably occur, and are very serious in their rapid course and destruction, and it is unwise to delay operation when one has to deal with them.

*Chronic middle-ear suppuration* is the *bête noire* of the general practitioner—it takes up so much time in treatment, and patients frequently carry out directions so badly. With children treatment often seems especially unsatisfactory. In the latter, it should always be remembered that an otorrhœa, established painlessly, profuse, thick, and often mixed with blood, is strongly presumptive of tubercle, especially when facial paralysis occurs early. Such a condition must always be kept in mind. The great majority of chronic middle-ear discharges in children are, however, kept up by adenoids and enlarged tonsils, and no headway can ever be made in these cases unless the naso-pharyngeal condition is rectified. When the discharge is profuse, the practitioner should see that the ears are regularly washed out two, three, or sometimes four times a day, and he should ascertain that a good glass syringe is used, and that it is frequently boiled. It is generally useful to order one to the nozzle of which is affixed three or four inches of fine rubber tubing, and this should be passed well into the meatus so that the lotion used washes the ear out from the deeper part of the canal. Of the various antiseptics at disposal I have generally found that 1 in 2,000 perchloride of mercury is the most useful. When the discharge is thick and mucopurulent an occasional preliminary cleansing with a solution of bicarbonate of soda is valuable. The association of chronic otorrhœa with gastro-intestinal disorders in infants should always be kept in mind.

In adults with chronic middle-ear discharge the two essentials of treatment are *efficient drainage* and *surgical cleanliness*. To these ends a careful preliminary examination and cleansing are imperative. Small perforations should be enlarged by a crucial incision, any granulations present removed, and the meatus should be thoroughly freed from all dead skin, inspissated discharge, and similar débris. Twenty minutes spent in such examination and cleansing will often avoid much vexation and failure in the future. When once the patient is thus put in an advantageous position for further treatment thorough antiseptic measures should be ensured, and for these the reader is referred to any good standard text-book. The so-called dry treatment—by means of insufflated powders—is one that demands care and watchfulness, since patients who



are at all neglectful may fill the ear with powder, until this becomes a hard cake behind which discharge accumulates. It should, therefore, be used only where discharge is scanty, the perforation large, and the patient can be seen frequently. The most useful instillations are peroxide of hydrogen (valuable for cleansing), which should be used cold and allowed to remain in the ear for fifteen minutes before syringing, and rectified spirit. A useful combination of the latter is with boric acid and glycerine—One drachm of the former with two drachms of spirit, made up to one ounce with glycerine.

In all cases of chronic suppuration, care should be taken to rectify any existing nasal or naso-pharyngeal condition, and to treat the patient constitutionally.

As regards the question of inflation in chronic suppuration, it should be remembered that this very valuable adjunct should only be done when the perforation is large. With small perforations its place is much better taken by suction with a Siegle's speculum.

It is a useful thing to know the significance of situation in regard to perforations. The majority of perforations are in the lower part of the membrane. When they are situated in the posterior superior quadrant they are often associated with caries of the long process of the incus, the ossicle which is most frequently diseased. Perforations in Shrapnell's membrane are the most serious of all, as they may indicate the presence of attic disease, especially when they have existed for any length of time. They are usually associated with caries of the head of the malleus or body of the incus, or of both ossicles. It may be taken, as a good general rule, that a perforation in Shrapnell's membrane is associated with nasal, Eustachian tubal, or tympanic trouble when it is situated anteriorly, with disease of the external meatus when it is in the centre, and with mastoid antrum disease when it is in the posterior part.

In dealing with *non-suppurative middle-ear disease* it is necessary to be very cautious in giving any prognosis as to improvement, especially in the later stages of the disease. Nor should any treatment be advised or prognosis given without careful examination of the ears, nose, and throat, of the functional condition of the ear, and of the general health

of the patient. For details as to these conditions the reader is referred to my paper in *THE PRACTITIONER* for 1908.<sup>1</sup> Care should be taken to distinguish post-catarthal conditions from otosclerosis. In testing with tuning forks, increased bone conduction always means pure middle-ear disease, but diminution of bone conduction is to be disregarded, generally speaking, unless it is over ten seconds in amount. A frequent error is to regard decreased bone conduction as indicative of internal ear complication. When such exists there is always a reduction in the hearing for high tones. Fixation of the stapes is certainly present when Rinne's reaction is negative to both C and C<sub>2</sub> forks, combined with increased bone conduction and reduction in the hearing of low tones. In other cases it is best to use Gellé's test in addition. In forming an opinion as to the possible success of treatment, it is a useful rule that, when hearing for the acoumeter and spoken speech is good compared with that for whispered speech, prognosis is better, and that it is worse when hearing for the acoumeter and the whisper is bad compared with that for spoken speech.

In treating middle-ear deafness from non-suppurative causes, the upper air-passages must never be neglected, and means should always be taken to ensure a proper nasal airway. When using inflation as a method of treatment the practitioner cannot be too strongly warned of the dangers of self-inflation, and should avoid teaching his patient to practise Valsalva's method. Deaf people who find benefit from auto-inflation, practise it in season and out of season, until they so stretch their tympanic membranes that they finally render them sufficiently lax to lie upon the incudo-stapedial joint and inner tympanic wall, and so interfere with the ossicular mechanism as to greatly increase their deafness.

Inflation practised by the practitioner should in the majority of cases be by means of the Eustachian catheter. By this method the force used is under control, one ear is treated at a time, and intratympanic injections can be made. It is, moreover, cleaner, for Politzer's air-bag is difficult to cleanse, and may, besides, blow unhealthy nasal secretions into the Eustachian tubes. The great secret of successful

<sup>1</sup> *THE PRACTITIONER*, Vol. LXXX., p. 115.

inflation is *frequency*. In the vast majority of cases, Eustachian catheterisation once a week is quite useless, the patient returning to his former condition before he is seen again. For it to be efficient it must be done every other day or even daily for from a week to a fortnight, and then with less recurring frequency for a variable time, according to the exigencies of the case. In testing these cases the practitioner will find it far more practical as a means of ascertaining their progress to rely upon speech (spoken or whispered) than upon the watch.

Tinnitus is one of the most troublesome symptoms to deal with, and the longer it has existed the more continuous it is, and the less it varies in character the more difficult is it to relieve. Local and constitutional treatment, attention to the digestive system, to the bowels, and to the circulation are necessary in addition to local measures. In pulsating tinnitus, dilute hydrobromic acid, in half drachm to drachm doses, is often useful.

*Diseases of the Internal Ear* come much less frequently under the notice of the practitioner than do affections of the external and middle portions. It is, however, highly necessary to have some knowledge of their differential diagnosis. The following general rules are useful as a rough guide in the diagnosis between deafness due to disease of the conducting mechanism and that arising from disease of the perceiving apparatus:—

*Obstructive* deafness may be suspected when: (1) there is loss of air conduction and Rinné's reaction is negative, (2) bone conduction is increased, (3) high-pitched sounds are heard better than those of low pitch, (4) hearing is better in a noise, and (5) the acoumeter is heard better than spoken speech.

*Perceptive* deafness may be suspected when: (1) bone conduction is diminished by more than ten seconds, (2) high-pitched sounds are badly heard, (3) hearing is worse in a noise, and (4) spoken speech is heard better than the acoumeter.

For all ordinary purposes, the tuning fork known as Lucaë's is the best to use; its note should be a middle C, of 128 double vibrations. Bone conduction should be tested



over the region of the mastoid antrum, comparison being made with that of the examiner.

The most important internal ear conditions likely to be met with by the general practitioner are those due to syphilis, congenital and acquired, mumps, and influenza. They are of special importance because treatment, to be efficient, must not on any account be delayed. Nerve deafness due to any of these three causes must be taken in hand at once, otherwise permanent loss of hearing will result. Syphilitic internal ear deafness may appear in either the secondary or tertiary stages of the acquired disease, and is usually easy of diagnosis. The congenital form may come on with vertigo, but is much more frequently unaccompanied by that symptom. All forms demand immediate and energetic treatment.

Deafness due to mumps may appear from the first to the third day, it may be as late as the sixth or seventh, and has been known to precede the primary disease. Usually the symptom is due to a labyrinthitis, but middle-ear deafness also occurs. In any case its prompt recognition is of grave importance as treatment, to be of any use, must be immediate.

The condition known as *Menière's disease* is, strictly speaking, one of intra-labyrinthine hæmorrhage, and is comparatively rare. Menière's symptom-complex—vertigo, vomiting, and tinnitus—occurs in other labyrinthine conditions besides hæmorrhage. In true Menière's disease, the patient is suddenly attacked with vertigo, nausea (usually with vomiting), and severe tinnitus. Recovery, which is delayed for several days, during which the sufferer is obliged to keep the recumbent position, is followed by slighter attacks from time to time. It should be mentioned that further attacks may often be guarded against by the wearing of a seton for several months.



## COMMON DISEASES OF THE HAIR.

BY TOM ROBINSON, M.D.,

*Physician to the Western Skin Hospital.*

It is intended in this paper to discuss only those diseases which attack the hair of the scalp.

We must grasp two facts in thinking about the hair. First the hair is nothing more than a dead horn which grows from its own papilla. Secondly human beings are born with a certain number of hair-papillæ which cannot be increased by any treatment; they cannot be increased in number any more than can the finger-nails.

The falling away of the hair is a process of long duration, sometimes from 10 to 20 years passing before baldness follows so little noticed is the beginning of the disease which causes the baldness.

We may divide the forms of baldness into the following groups:—Alopecia Adnata, Alopecia Senilis, Alopecia Prematura, Alopecia Somatica, Alopecia Areata, Alopecia Mycotica, Alopecia Symptomatica.

*Alopecia Adnata.*—This deals with a very rare condition. It is known that a child may be born with hair which is shed and which never returns. A more frequent condition is that in which the hair does not exist at any period intra- or extra-uterine of the child's existence. There never has been the formation of the hair-papillæ. The two cases differ in the natural history. A child born with hair which is shed soon after birth does not at any period grow hair; whereas a child born without a hair system may and often does as years roll on begin to grow a little woolly hair which gradually lengthens, and at middle life is to all external appearance normal.

*Alopecia Senilis.*—As a general rule elderly people lose a great part of the hair of the head before they die, so we may say that senile baldness is a physiological process. The process is as follows:—The hair on the summit of the crown often turns grey, then becomes thin, and a round place gets bald; at first a few tiny hairs reproduce themselves and give rise to false hopes; gradually, however, the process is completed,

and the skin becomes smooth and shiny, like the skin of an eel. The skin during this process does not show any other changes, and this is the characteristic of the process. Gradually the hair falls from the temples, and at last constitutes what is sometimes known as a moon scalp. The baldness is never total, but leaves a fringe like that of a monk. The other hairy portions of the body escape the process; on the contrary, old people grow very strong and thick hairs over their eyes and at the entrance to the porches of the ears and the nostrils. This exuberant growth is a great cause of annoyance to elderly women, who often are driven to the doctor to remove well-grown hairs from their faces. Shakespeare did not miss this fact, and speaks of an old woman with a beard.

The age in which alopecia senilis makes its appearance amongst men cannot be accurately stated. Many factors have their say in the matter; in other words age has nothing to do with the almanac. The way of living, heredity, and especially the hard task of existence, the rapidity of life, the drinking of alcohol, too little sleep, and debauchery, all play their part in producing early baldness. There is a good deal of truth in the proverb "Amusement has driven away the hairs of the bald."

*Alopecia Prematura.*—Heredity here plays the most important part in the early loss of hair; we know of families in which early baldness is common amongst its male members; one is especially in my mind as I write in which four males had bald heads when 25 years of age.

*Alopecia Somatica.*—A certain casting of dead epithelial scales from the scalp and general surface of the body is a normal and natural process, as is the falling off of the hair; but when this falling off is enough to be obvious on the coat collar, when the scalp becomes irritable and feels constricted, we pass from a physiological process to a pathological one.

If we examine cases of loss of hair which come before us we shall find that by far the greater number of the subjects have irritable and scurfy scalps—a condition which has probably existed for a long period. Now these scurfy scalps divide themselves into two groups, in one the scales are stuck together which mats the hair and if peeled off can be made any shape and is very like ear-wax; underneath this coating is a moist,



red and inflamed surface, which, when devoid of hair, has all the appearance of a nutmeg grater, the depression being caused by the empty hair-follicles. The condition of the skin is eczematous, and if too bold remedies are used the moisture is very abundant. The coating on the scalp is exactly such as we find in young children and which is so frequently the forerunner of an infantile eczema. This paste-like coating is always circumscribed. The patches are usually of different sizes. The patients complain at first of irritation, heat, and tenderness, all of which diminish as the hairs fall out, which occurs very quickly, almost as suddenly as in cases of alopecia areata.

The attacked positions soon become bald and the skin remains red and has a thin coating of fatty material. The baldness which follows *seborrhœa oleosa* is always recovered from if treated correctly.

We say nothing here of this malady attacking, as it often does, any portion of the body which grows hairs. It is admitted that *seborrhœa* is often a family disease. If we examine the whole of the members of a family we commonly find *seborrhœal* manifestations in many of them; one may have a greasy scalp, another disease of the eyebrows or eyelashes, another some form of eczema, whilst the father may be the victim of somatic baldness.

We mention this fact because we are so often asked by the laity, "Is *seborrhœa* a contagious disease?" The works of Unna and Sabouraud rest entirely upon a scientific basis. Unna found in the squama of *seborrhœa* the same micro-organism which he also found in any eczema, whether its origin was *seborrhœic* or otherwise. The micro-organism is known as the bottle-bacillus. The finding of a micro-organism in a morbid process that does not necessarily prove that this is the cause of the malady; one must also use cultivation and inoculation as tests.

Sabouraud's explanations have caused quite a sensation. He asserts that the same micro-organism which causes *seborrhœal alopecia* is the cause of *alopecia areata*; both are produced by the toxin of the same bacillus. Sabouraud also asserts that he has grown this bacillus, has used the toxins as inoculations on animals, and has succeeded in producing

baldness. A great many clinical misgivings arise in one's mind before accepting this hypothesis. It is impossible to believe that two diseases so different in their clinical manifestation and natural course as alopecia areata and seborrhœal baldness can have a common origin.

The form of the seborrhœal baldness which we first discussed is not so common as the variety which now comes under observation, namely, the loss of hair which is caused by the dry form of seborrhœa, or, in other words, seborrhœa sicca. As we stated before, a certain casting off from the scalp of dead epithelial scales is as natural a process as is the moulting of birds. Yet if a patient of sixteen years of age or over comes to us with a gradually increasing desquamation of the scalp, which may show itself generally or locally, if these scales can be easily detached from the scalp we say it is a case of seborrhœa, if, further, the hair is losing its lustre, and is becoming scanty and shorter we know that baldness will ensue unless the disease is arrested. The first symptom often noticed is white, dry scales on the clothes, as if they had been dusted ; especially is this the case if the hair is greasy, or if grease has been applied. If we detach these dry scales when they are first observed the scalp beneath is to the naked eye normal ; as the disease advances we find the skin under the scales distinctly red and if the disease is allowed to continue an eczematous condition sometimes follows and the patient suffers from considerable itching, which, if scratched with the comb, causes blood crusts, which are readily seen as firmly adherent scabs. It is astonishing to notice how often a very extensive seborrhœa may exist without much loss of hair, whilst it is often noticeable how much falling of hair there is with so little evidence of disease of the scalp. Yet as a rule we shall find in cases of baldness which are not congenital some traces of excessive epithelial proliferation.

In order to ascertain the commencement of alopecia, Pincus advises the collection of the falling hair on four successive days by means of combing with a fine comb and calculating the proportion of the pointed hairs to the total loss. Should this amount be 1 in 8 it is abnormal, that is if the average length of the hair is 13 centimetres. A more simple plan with men is to take four days' combings and then to

take an average of the quantity of the hairs which have been clipped (we know them by their square ends) and of those which have not been clipped (we know these by their pointed extremity), then if the proportion of the former is as 20 to 1 we need have no anxiety as to the future. The prognosis in cases of seborrhœic baldness is generally an unfavourable one, especially in the last stage of the disease, because it is just as impossible to renew the hair papillæ as it is to grow new teeth in the places where the old ones have fallen out. On the contrary, the prognosis is very good where the disease is recent. This naturally leads us on to the treatment of seborrhœa of the scalp. The patient must wear light, loose hats, which permit ventilation. The scalp must be washed with soap twice a week; equal parts of soft soap and eau-de-Cologne answers well. After a careful shampooing the scalp must be well cleansed of the soap and an ointment containing sulphur and salicylic acid used. This treatment must be continued until the scalp looks clean and the hair falls out only in a correct manner. Careful and persevering as we may be we shall find that a scalp which is seborrhœic is always seborrhœic, so we are unable to speak of curing the case, but what we can promise is that the growth of hair returns in early cases, and also that a use of a hair-wash containing quinine and zinc with spirit will maintain a clean scalp and will assure the patient his normal hair-growth.

In some cases the hair requires fat, probably the best kind is a pomade made with oil of eggs. This permeates the epidermis and does not make the hair sticky.

By far the most important part of the treatment of all forms of baldness is for the patient to brush the hair twice daily with a soft hair brush in which the bristles are of different lengths. The brushing should only be from the summit of the crown downwards. The hair should never be brushed against its natural course of growth.

*Alopecia Areata*.—The chief characteristics of alopecia areata are its sudden and unexpected appearance, its rapid development, its circumscribed limitations, and the non-existence of skin irritation.

This is the story we hear from our patients: "A patch



of baldness has suddenly been found on my scalp." If we examine the patch we shall find it resembles in size a shilling ; it is practically without hair. The hair around the patches falls out easily. In some examples there is only one patch, whilst in others several may be found, and these by running into each other may clear the scalp of a large amount of hair. Sometimes we gather a history of headache or a disturbance in the general state of health ; we need not attach any significance to these symptoms, they are only coincidences. If the disease has existed for any length of time the bald area is slightly depressed ; we may, and often do, find a little scaliness at the beginning of the disease.

The bald places are very commonly found on that part of the scalp which is not covered by the hat and which might rest upon the cushion of a train or public vehicle. We should like to say in this place that we are familiar with a group of cases in which the bald places commence symmetrically, spread on uninterruptedly and destroy every hair on the body, even those on the limbs.

In some cases it has been possible to recognise these cases early by remembering the symmetrical nature of the disease and especially by noticing the falling out of the hairs inside the nostrils and at the orifices of the ears.

These cases are often very distressing to the patient and cause much grief ; so much is this so that a case is well known where a man spent a big fortune in trying to reproduce the hair and ultimately lost the balance of his brain and committed suicide.

What is curious is to know that these patients enjoy good health and only suffer from an artistic feeling.

We even meet with cases in which the bald areas have a few straggling hairs on the surface and slight scaliness. These occur at about the age of puberty, or before, and are not met with in middle life. Other cases come before us which are often mistaken for alopecia areata ; they present a number of scars which exist on the crown and forehead of women. The scars are not circular, they are well below the level of the skin, and their surfaces are like the surface of a china cup ; cicatricial baldness is a good name for such a condition. These scars are doubtless caused by the injury inflicted to the hair

bulbs by the barbarous way in which women twist their hair and leave it strained and cramped through the night. This, of course, diminishes the blood supply. Perhaps the singeing of the hair is the most frequent cause of cicatricial baldness of which we know.

The hairs which grow after the successful treatment of alopecia areata are at first colourless, and sometimes they never become normal. We may state with certainty that all causes of alopecia areata before the age of 40 years will recover the colour; after that all the hairs usually remain grey.

All experiments made to prove the contagiousness of this malady have failed. The first reason is because so many live substances settle in the hair and produces spores. Still the whole attitude of the disease, the way it originates, its sudden stand-still, its transmission, all point conclusively to its origin being vegetative. This view certainly influences our treatment.

Many examples uphold the theory of contagion. The disease often attacks near relatives; it appears in men who use the same hairdresser. It is shown conclusively to be carried from animals to human beings. I have seen three men in a village with a population of 220 with typical alopecia areata. An actor who played Sir Peter Teazle had the disease; his understudy, who wore his wig, had it also. Recently an epidemic of alopecia areata broke out in Paris among the fire brigade; twenty men were attacked by the disease at the same time. These firemen, when on duty, lay on the bed and pillow used by their comrades. Curiously the disease in nearly all of them appeared on the back of the head. In one of our line regiments nine cases appeared within a week of each other. In an orchestra three of the men have had the disease. A woman had alopecia areata; she had a pet dog with the typical bald places of alopecia areata. It is quite common to find the disease amongst fox-hounds, or other dogs which live in kennels. The following experiment has been made:—The coats of some white mice were smeared with grease, and the mice were then put into the combings of a woman who had alopecia areata. The mice lost their hair over the whole body. It is said that if the scurf of a man or woman with alopecia areata is combed into the hair of a

rabbit, the animal soon loses its hair.

*Alopecia Mycotica*.—We embrace in this group the diseases which attack the hair and which are due to the germinating fungi which lead to alopecia. We can only speak of them here so far as they have anything to do with the falling off of the hair. Let us take in the first place common ringworm. This disease is caused, as is well known, by the settling down of the *Tricophyton* on the scalp. This fungus finds its way into the hair follicles, penetrates the hair shafts, causes the hairs to lose their lustre, to break off short, and in the course of time to fall out. These patches are quite characteristic with the clubbed hair on the surface and the branny look of the skin. Sometimes a few vesicles form around the ringworm patch; in other cases the fungus sets up irritation, and we find pus oozing out of the hair follicles; when this is the case we know the condition as *kerion*. The scalp is raised above the level of the skin in a well-defined boggy mass. We need not be anxious about the ultimate restoration of the hair in cases of ringworm, if we remember the golden rule of using our remedies made to suit the susceptibility of the skin. We are convinced that many a permanent scar is produced on the scalp by the too vigorous treatment of ringworm, with such potent remedies as carbolic acid or sublimate. The treatment of ringworm has now fallen under the X-rays, and undoubtedly brilliant results are obtained; but here again caution and common sense, with a thorough knowledge of the technique of the process, are necessary. Otherwise, instead of a cure, we may be dismayed to find quite a large tract of the scalp hairless and covered only by a scar which is practically devoid of any hair follicle.

*Favus* is not common in England, except amongst the aliens. As is well known it is caused by the invasion of the skin by a vegetable parasite; it is found usually on the hairy scalp, and forms disc-shaped sulphur-coloured cups, which show a distinct depression in the centre. When the crusts fall off or are pulled off the skin beneath is atrophied, the follicles are destroyed, and a permanently bald patch is found. There is a characteristic mouse-like odour about these patches. *Favus* is a disease which usually appears early in life, persists, and disappears spontaneously when almost every hair follicle



is destroyed. Favus is met with on other parts of the body ; the nails may be attacked.

*Alopecia Symptomatica.*—We will consider this under two classes :—A. Baldness the result of diseases of the skin causing destruction of tissue, and B. Baldness caused by some general blood disease or exhausting malady.

In class A. we would place any permanent scar, the result of an injury such as a burn, a blow, or too severe treatment. Also these cases already alluded to which are the result of the toilet operation. We also find the varieties of Lupus causing baldness ; especially is this so in cases of Erythematous Lupus. I have a drawing in my possession which demonstrates this condition. The usually bald region is covered by a thin shiny scar, which at times bursts into pustular crusts, especially at the edges, and, as is well known, sometimes this edge becomes malignant. The later manifestations of syphilis often attack the scalp and leave on their way kidney-shaped scars. Some of the cases of psoriasis cause permanent baldness ; when this is the case it is, we believe, caused by the use of too strong remedies. The same applies to eczema, a disease which is not usually followed by permanent baldness even when it is pustular.

In class B. we must include those cases of loss of hair which we meet with in many cases of infectious disease. How it is that scarlet fever will in some instances cause the falling off of almost every hair upon the body and even of the nails, whilst the same malady in other persons will not cause any appreciable falling off of the hair is probably a question of vulnerability of the epithelial structures. Measles, small-pox, and typhoid and typhus fevers are often the causes of loss of hair. The poison or the toxins in the blood obviously kill the hair for a time, as also will many impoverished states of the organism caused by too much motherhood, any exhausting life, sickness or anæmia. Each case of baldness must be met by a rational recognition of its causes, and this cause must be treated.

The hair is often shed to a slight extent in cases of syphilis. The falling off is general. Out of 70 patients with syphilis I find that 59 had perceptible loss of hair, such loss occurring in from the third to the ninth month. The hairs at

first lose their gloss and then become dry and discoloured and are easily combed out.

True syphilitic alopecia need not be accompanied by local phenomena of eruption or desquamation. The quantity of hair shed varies considerably. I have known the hair of the whole of the scalp, of the eyebrows, as well as the axillary and pubic hair, to be shed. The early stage of syphilitic alopecia is coincident with syphilitic roseola.

We should like to draw attention to the loss of hair which is met with in cases of myxœdema. Sometimes the hair of the head is little more than a few thin shabby-looking dried hairs, which fail to cover a dried, wizened-looking scalp. The association of two diseases is common. The exhibition of thyroid extract will cause the hair to improve considerably.

It is known that the shorter the hair is the quicker it grows. Thus it is that if we cut short the long hair of a woman it takes many months before the hair grows again to its original length; but if this same head of hair is again cut short we shall find that it grows quickly at first but never attains the length of the original hair. This, of course, speaks against the frequent cutting of the hair. Another factor tells against the too frequent visit to the haircutter, which is that the hair never has any rest. We have many instances of injury done by over-exertion of other organs.

The most frequent cause of the loss of hair is doubtless seborrhœa. It is also found that men, who have their hair cut short more frequently than women, are the first to become bald.

In all individuals it is a good plan to have the hair cut once a month, to have the scalp shampooed once a fortnight, and to have the scalp constantly and abundantly brushed. We must especially again point out that the hair must never be brushed in a direction contrary to its natural direction of growth. The brushing stimulates the skin and removes the dead hairs. So much so is this the case that our patients will refuse to submit to brushing because, as they say, "it fetches out the hair." The proper reply is, "So much the better, as empty houses are better than bad tenants." If the hair is falling from a scalp on which we find dry epithelial scales we may be sure that there is a deficiency of oil which it is

wise to supplant.

For the sake of convenience we order a hair lotion as follows :—

|   |                   |   |   |   |    |      |
|---|-------------------|---|---|---|----|------|
| R | Ol. Olivæ         | - | - | - | -  | ʒiv. |
|   | Liq. Ammoniæ      | - | - | - | -  | ʒiv. |
|   | Spir. Myrciæ      | - | - | - | -  | ʒiv. |
|   | Spir. Rectificat. | - | - | - | ad | ʒiv. |

M. Ft. Lotio. Sig. The Hair Lotion.

This is ordered to be dispensed in a sprinkle-bottle which is to be used at intervals if there is necessity. If however the hair is falling in an individual where the scalp is moist or greasy we must order a hair lotion without oil. Such as :—

|   |                   |   |   |   |    |      |
|---|-------------------|---|---|---|----|------|
| R | Tinct. Aconiti    | - | - | - | -  | ʒj.  |
|   | Liq. Ammon. For.  | - | - | - | -  | ʒiv. |
|   | Tinct. Capsici    | - | - | - | -  | ʒij. |
|   | Ol. Rosmarini     | - | - | - | -  | ʒj.  |
|   | Linim. Camph. Co. | - | - | - | ad | ʒiv. |

M. Ft. Linim. pro capite.

This must be carefully rubbed into the scalp with a piece of flannel.

It is of essential importance that in all cases of loss of hair the restoration to a normal state will only follow when the blood is adequate in quantity and pure in quality, so we must leave the question of food and remedies to be applied to each case if it is necessary.

We are sometimes asked to prescribe for cases of loss of hair with irritation and inflammation of the scalp. In such cases we must not order anything stimulating but rather the following :—

|   |                 |   |   |   |    |         |
|---|-----------------|---|---|---|----|---------|
| R | Glycerin.       | - | - | - | -  | ʒij.    |
|   | Sodii Bibor.    | - | - | - | -  | ʒij.    |
|   | Aq. Laurocerasi | - | - | - | -  | ʒij.    |
|   | Aq. Destill.    | - | - | - | ad | ʒviiij. |

M. Ft. Lotio. Sig. The Hair Lotion.

Much of our success in treating baldness will depend upon the early recognition and treatment of seborrhœa. In this disease we must insist on a faithful carrying out of the treatment, which must commence with a complete shampooing of the scalp every other day for at least two weeks. A shampoo liquid which will be found useful and efficacious is made as follows :—



|   |                   |   |   |   |      |      |
|---|-------------------|---|---|---|------|------|
| R | Ol. Lavand.       | - | - | - | -    | ℥xx. |
|   | Saponis Mollis    | - | - | - | -    | ℥ij. |
|   | Spir. Rectificat. | - | - | - | -    | ℥ij. |
|   | Aquam -           | - | - | - | - ad | ℥vj. |

M. Sig. The Shampoo.

Use one tablespoonful for each process.

The scalp must be well dried and afterwards the following ointment rubbed into avenues made by dividing the hair into partings two inches apart.

|   |                 |   |   |   |   |       |
|---|-----------------|---|---|---|---|-------|
| R | Sulphur Precip. | - | - | - | - | ℥iii. |
|   | Ac. Salicylic.  | - | - | - | - | ℥j.   |
|   | Ol. Lavand.     | - | - | - | - | ℥xx.  |
|   | Lanolin.        | - | - | - | - | ℥j.   |
|   | Paraffin Moll.  | - | - | - | - | ℥ii.  |

M. Ft. Unguent. Sig. The Pomade

We must again say that seborrhœa is an incurable disease. We are able by treatment to get rid of the obvious scales and we are able to get the hair to grow, but there will be during life an excessive epithelial production which can only be kept down by using the hair lotion containing oil and ammonia.

The treatment of special diseases of the scalp would take up more space than we have at our disposal. We may say that the rubbing in of sulphurous acid into the bald patches of alopecia areata has been uniformly successful, and that in cases of ringworm an ointment made containing quinine, mercuric chloride, salicylic acid, and camphor has been used at the Western Skin Hospital for a long time with satisfactory results.

It must be stated, in conclusion, that great perseverance is required by both the doctor and patient in the treatment of diseases of the hair. We are often astonished at the rapidity of the growth of the hair, after it has fallen as a result of the exanthemata, when the general health is restored. We must be careful not to claim the satisfactory result entirely for our remedies. Time has been the remedy. It is otherwise with the other forms of baldness. We can in many instances gain good results, but we must always remember that in cases of senile baldness, or the universal kind, we are without any remedy which will either produce a single hair from an atrophied papilla, or produce on any scalp a single hair papilla.

## Notes by the Way.

### A New Professional Centre.

It has always been our endeavour to associate ourselves helpfully with the everyday practical needs and business interests of the Profession. We have often been advised, however, and indeed we have long felt, that the elaborate and perfected machinery of our large organisation should be turned to account, in supplying, for the benefit of our subscribers, a single convenient centre for the transaction of their various kinds of professional business under one roof. The establishment of such a centre has been decided upon and our plans are now complete, with the exception of the necessary legal formalities with which the solicitors are at present dealing.

\* \* \* \* \*

### The Various Departments.

THE organisation which we are able to place at the disposal of our subscribers is so exceptionally extensive and of so far-reaching a character that it is eminently suitable for the creation of a centre. Our readers will perceive, when they study the sub-joined list of the seven new departments, that—with the facilities we already provide—practically every ordinary professional requirement is embraced. The new departments will come into operation on the 1st of January 1910 and are as follows:—

- (1) The Transfer of Practices.
- (2) The Negotiation of Partnerships.
- (3) Medical Accountancy.
- (4) The Collection of Professional Debts.
- (5) The Supply of Locum Tenens.
- (6) A Sale and Exchange.
- (7) The Advising upon, and Effecting of, every kind of Insurance.

**No Increase of  
Subscription.**

MOST of the existing societies dealing severally with the above businesses are hampered with heavy expenses in the shape of large salaries, rent, light, rates, etc. Our new departments will not be burdened with any such encumbrances, as they are already borne by our existing organisation. It is, therefore, not necessary to raise the subscription to *THE PRACTITIONER*; certain nominal charges, however, must of course be made in connection with some of the new departments, but only when they are used. The charges will be small compared with the services rendered.

\* \* \* \* \*

**Howard Street,  
Strand.**

THE new work will be carried out at Howard Street, where, in our own building, there is spacious accommodation for the development of all these departments. Howard Street is situated just off the Strand, and is easily accessible from all parts. Every assistance will be offered subscribers regarding their various wants, and every convenience will be at their disposal.

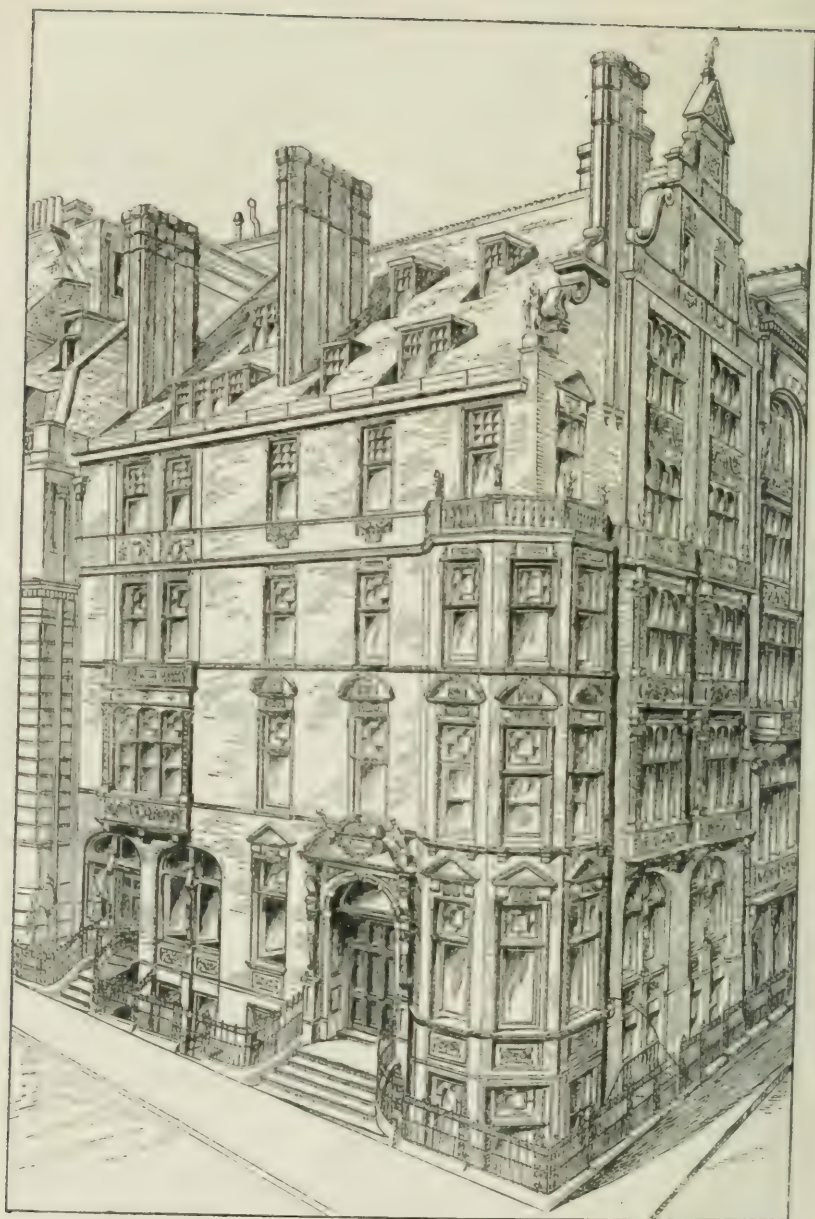
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**£20,000.**

*THE PRACTITIONER* Insurance Benefits will remain as heretofore. Our readers will be interested to learn, as a practical demonstration of the extraordinary utility of these Benefits, that the sum already paid out amounts to no less than £20,000. Grateful letters from those who have benefited are continually reaching us, and show conclusively that the Profession is extremely appreciative. But what perhaps pleases us more than anything else is the knowledge that the Profession as a whole realises that the more they support us the more we are able to do for them—individually and collectively—and it is this knowledge that has encouraged us to enlarge our fields of usefulness in accordance with the wishes of so many of our supporters.







The Practitioner BUILDING

WHERE THE NEW WORK WILL BE CARRIED OUT (see p. 580).

## NOTES FROM FOREIGN JOURNALS.

## TREATMENT OF ANOREXIA IN CHILDREN.

Anorexia in a child can only be looked upon as a symptom the origin of which must be determined. (a) In nurslings, with no congenital malformation, it is connected with congenital debility, a lesion in the brain, obstinate constipation, digestive upsets due to errors in food, or some acute disease. (b) In older children anæmia and tuberculosis are often ushered in by persistent anorexia, among other symptoms. Most febrile diseases, acute infections (typhoid in early stage), dyspepsia, gastro-intestinal infections with dilated stomach, and some neuroses are usually accompanied by anorexia. The urine should always be examined for albumen before prescribing the treatment.

The pathogenic treatment will vary according to the ætiological factor shown by the clinical examination to be the origin of the loss of appetite. Any one of the following may be present:—Chlorosis, tuberculosis, uræmia, alcoholism, hyper- and hypo-chlorhydria, dilated stomach, chronic dyspepsia, constipation, hysteria, or neurasthenia.

The symptomatic treatment is directed (1) to diet, meal-times must be strictly ordered, but the child should be allowed some choice in its food, within limits. Vinegary food and spices must be forbidden. (2) Life in the open air. Physical exercise must not be carried to fatigue-point. The trunk should be massaged daily, morning and evening, with spirits of camphor. Better are hydrotherapy and massage. In summer, a high-altitude treatment must be carried out. (3) Prescribe aperitives and, if necessary, eupeptics, such as:—

Decoction of cinchona, giving one teaspoonful or one tablespoonful a quarter of an hour before each meal;

Or, Variot's prescription:—

|                   |   |   |   |   |   |          |
|-------------------|---|---|---|---|---|----------|
| ℞ Arrhenalis      | - | - | - | - | - | gr. iss. |
| Syrupi Cinchonæ   | - | - | - | - | - | ℥ij.     |
| Aquam destillatam | - | - | - | - | - | ad ʒvj.  |

Misce. Fiat mistura.

"Two teaspoonfuls for children of 18 months to 2 years old; one tablespoonful for 2 to 4 years old; two dessertspoonfuls from 4 to 8 years old.

If the child is more than 6 years old, give Carrien's prescription:—

|                           |                |
|---------------------------|----------------|
| ℞ Tincturæ Nucis Vomicae, |                |
| Tincturæ Quassia,         |                |
| Tincturæ Rhei,            |                |
| Tincturæ Calumbæ,         |                |
| Tincturæ Gentianæ         | - - - ana ʒij. |

Misce. Fiat mistura.

"Three to four drops one quarter of an hour before meals in one table-spoonful of Vals or Vichy water;"

Or, one tablespoonful of Hepp's "dyspeptine":—

|                            |   |   |   |   |            |
|----------------------------|---|---|---|---|------------|
| ℞ Pepsinæ                  | - | - | - | - | gr. xv.    |
| Acidi Hydrochlorici Diluti | - | - | - | - | ℥v.        |
| Saccharis                  | - | - | - | - | gr. viiss. |
| Aquæ Tiliæ                 | - | - | - | - | ad ʒiij.   |

Or, A cachet of pancreatine (gr. iss-viss) with a little

Vichy water.

Or, if the child is over 5 years old:—

|                        |   |   |   |   |                     |
|------------------------|---|---|---|---|---------------------|
| ℞ Strychninæ Sulphatis | - | - | - | - | gr. $\frac{1}{4}$ . |
| Syrupi Aurantii        | - | - | - | - | ℥i.                 |
| Aquæ destillatæ        | - | - | - | - | ad ℥vj.             |

"One teaspoonful before each of the two chief meals in a little sweetened water."

Livy and Rothschild find that some forms yield to thyroid treatment. They give one or two pastilles of gr. iij. to gr. vj. each day for ten days and then refrain for a while.—(*Annales de Méd. et Chirurg. infantiles.*)

#### MORPHINE IN THE TREATMENT OF WHOOPING-COUGH.

Weill and Mouriquand have made successful use of the hydrochloride of morphine in several cases of whooping-cough complicated with spasm of the glottis. They prescribe .005 mg. (gr.  $\frac{1}{4}$ ) of morphine hydrochloride in a warm enema, which is to be retained. The effect of the drug was not very noticeable upon the number of attacks, but was remarkable upon the frequency and the severity of the glottic spasms. In every case it is necessary, according to the authors, never to exceed in a child the dose of .005 mg. of morphine in the enema, in view of the lessening of the organic resistance induced by this drug. The fact that pulmonary infection and bronchopneumonia are a constant danger for a child with whooping-cough, must never be forgotten.—(*Annales de Médecine et Chirurgie infantiles.*)

#### TREATMENT OF HEADACHE.

Lemoine and Gérard give, in their *Formulaire-consultations médicales et chirurgicales*, the main lines of the treatment of headache. It is a symptom associated with numerous causes: diatheses, toxic or infectious diseases, neuroticism, and others. It comes on suddenly, or persists almost without ceasing. It is distinct from migraine, being seated around, behind or upon the cranium; the pain is deep and penetrating or superficial, and at times a simple sensation of emptiness.

It is necessary to distinguish each variety.

*The Headache of Arthritism.*—Very obstinate and painful, seated on the forehead and the temples. Two teaspoonfuls of bicarbonate of sodium should be taken during the day in Vichy water, or 2 g. (gr. xxx.) of lithium benzoate. Morning and evening a cachet should be taken, containing:—

|                        |   |   |   |   |            |
|------------------------|---|---|---|---|------------|
| ℞ Quininæ Valerianatis | - | - | - | - | gr. iij    |
| Pyramidoni             | - | - | - | - | gr. iiss.  |
| Lithii Carbonatis      | - | - | - | - | gr. viiss. |

Misce.

Plenty of warm drinks should be taken at meals, the bowels should be washed out every day, and a hot bath should be taken, or hot lotion applied to the head. In some cases a small dose of potassium iodide (gr. iij.) may be added to the alkalies.

*The Neurasthenic Headache.*—The best treatment is the static electrical bath and effluvia when it is possible. The following ointment should be rubbed in behind the ears:—

|                 |   |   |   |   |         |
|-----------------|---|---|---|---|---------|
| ℞ Mentholis     | - | - | - | - | gr. iv. |
| Paraffin. moll. | - | - | - | - | ℥v.     |

Misce. Fiat unguentum.



Two cachets containing the following should be taken during the day :—

|                       |   |   |   |   |                     |
|-----------------------|---|---|---|---|---------------------|
| ℞ Pulveris Valerianæ, |   |   |   |   |                     |
| Camphoræ              | - | - | - | - | ana gr. iij.        |
| "Methylene-blue"      | - | - | - | - | gr. iss.            |
| Pulveris Myristicæ    | - | - | - | - | gr. $\frac{3}{4}$ . |

Careful attention must be paid to the digestive functions and the bowels.

*The Headache of Arterio-sclerosis.*—This is associated with the condition of the arteries, thickening of the membranes and cerebral anæmia. From time to time small blisters should be applied behind the ears. For occipital pain the actual cautery should be lightly applied to the neck every day for 25 days. Two or three tablespoonfuls of the following should be taken daily :—

|                            |   |   |   |   |         |
|----------------------------|---|---|---|---|---------|
| ℞ Sodii Glycerophosphatis, |   |   |   |   |         |
| Potassii Glycerophosphatis | - | - | - | - | ana 3i. |
| Syrupi Codeinæ             | - | - | - | - | 3iss.   |
| Tincturæ Nucis Vomicae     | - | - | - | - | ℥xxx.   |
| Aquam Menthis Piperitæ     | - | - | - | - | 3iij.   |

Misce. Fiat mistura.

Compresses soaked in some sedative lotion should be applied.

*The Syphilitic Headache.*—The specific treatment must be carried out, to which may be added arsenic and the phosphates.

|                        |   |   |   |       |
|------------------------|---|---|---|-------|
| ℞ Liquoris Arsenicalis | - | - | - | ℥xxx. |
| Sodii Phosphatis       | - | - | - | 3ss.  |
| Aquam destillatam.     | - | - | - | 3x.   |

Misce. Fiat mistura.

If the headache is nocturnal, give 5 grains of veronal in a cachet at bedtime. In obstinate cases, perform lumbar puncture and remove 10 c.c. (3iij. of fluid.—*Journal de Médecine et de Chirurgie pratiques.*)

#### AN APERITIVE FOR QUITE YOUNG CHILDREN.

One tablespoonful of the following mixture should be given a few minutes before each meal :—

|                      |   |   |   |          |
|----------------------|---|---|---|----------|
| ℞ Sodii Bicarbonatis | - | - | - | 3iss.    |
| Syrupi Gentianæ      | - | - | - | 3iss.    |
| Syrupi Cinchonæ      | - | - | - | 3iiss.   |
| Aquam                | - | - | - | ad 3xij. |

Misce. Fiat mistura.

(*Journal de Médecine.*)

#### THE TREATMENT OF FURUNCULOSIS.

Lecturing on this subject, Professor Robin remarked that although furunculosis usually lasted for some months, it is possible by treating the patients methodically and with careful attention to cure them fairly quickly. A patient was shown in whom the attack had lasted for six months and who was covered with scars from boils. She had been in hospital for a fortnight and was fit for discharge. Furunculosis attacks the "pilo-sebaceous" apparatus. The particular inflammation is due to the staphylococcus which gains entrance by a skin-crack. It does not consist of a local lesion only, but is promoted by internal derangements, such as extensive infections, fermentative dyspepsia, congestion of the liver, constipation,

arthritis and diabetes, etc. Treatment, therefore, must be local and general. Under normal conditions the staphylococcus is found in the skin, consequently an attempt should be made at the outset, as a preventive measure, to destroy it. For this sulphur baths are indicated; but as these are often irritating to the skin, a less intense action may be obtained by using:—

℞ Sodii Sulphidi Crystallizati - - - 3 gr.-i.  
Sodii Carbonatis Exsiccati,  
Sodii Chloridi Exsiccati - - - ana 3vii.

Misce. Fiat pulvis.

“For one bath.”

A boil, when only in process of formation, can often be aborted by covering it with tincture of iodine, three or four successive layers being applied. When suppuration is established, after a thorough application of tincture of iodine, an incision must be made aseptically, the contents expressed, and into the cavity as much as possible of the following soft paste introduced:—

℞ Sulphuris Sublimatæ,  
Pulveris Camphoræ - - - partes æquales.  
Glycerini - - - q.s.

The boil is dressed with wool soaked in glycerine, then the whole is covered with dry absorbent wool. This dressing is renewed daily.

The internal treatment, common to all patients, is at first based upon the use of sulphur given in an electuary, such as:—

℞ Sulphuris - - - 3iiss.  
Melis - - - 3vi.  
Camphoræ - - - gr. v.

Misce. Fiat electuarium.

Capiat 3iij. vel iv. quotidie ante cibis.

In addition, the patient must take “saturation powders,” to remedy the intestinal fermentations so common in these cases:—

℞ Magnesiæ Hydratis - - - 3iss.  
Lactosi - - - 3iss.  
Sodii Bicarbonatis,  
Calcii Carbonatis Præcipitati - - - ana 3i.

Misce. Fiat pulvis et in partes xij. dividendum.

Capiat i. ter quotidie.

As a drink, the patient must take 1 to 2 litres ( $1\frac{1}{2}$  to  $3\frac{1}{2}$  pints) of ordinary tar-water during the day. Constipation must, at the same time, be prevented by the frequent use of laxatives, especially salines. The dietary of the patient must be attended to. No fermented food, like cheese, must be eaten, and neither *charcuterie* nor fish. The food should be very well cooked, and be, as far as possible, vegetable. When these precautions are carefully carried out, it is but rarely that furunculosis is not checked and the outbreak stopped.—(*Journal de Méd. et de Chir. pratiques.*)

#### FOR EMPHYSEMA AND CHRONIC BRONCHITIS.

The following two prescriptions are frequently used by Professor A. Robin for the relief of these complaints.

When there is not much cough, which is, however, useful for helping expectoration, this may be furthered by making the expectoration looser.

Then he orders:—

|                        |   |   |   |   |   |           |
|------------------------|---|---|---|---|---|-----------|
| ℞ Antimonii Oxidi      | - | - | - | - | - | gr. xv.   |
| Syrupi Ipecacuanhæ     | - | - | - | - | - | ʒiiss.-v. |
| Tincturæ Aconiti       | - | - | - | - | - | ℥xv.      |
| Syrupi Opii            | - | - | - | - | - | ʒv.       |
| Tincturæ Nucis Vomicae | - | - | - | - | - | ℥x.       |
| Aquæ Lauro-cerasi      | - | - | - | - | - | ʒj.       |
| Aquam Tiliæ            | - | - | - | - | - | ad ʒiv.   |

Misce. Fiat mistura. Capiat ʒss. secundis horis.

Robin uses the antimony and ipecacuanha for their liquefying effect upon the bronchial secretion, making expectoration easier. The aconite and opium dry up the secretion; nux vomica stimulates the action of the bronchial muscles, and the last two items cover the flavour and act as the vehicle.

When the cough is violent and exhausting, the best agent for quieting it is bromoform combined with bryony, grindelia, and hyoscyamus.

|                         |   |   |   |   |     |        |
|-------------------------|---|---|---|---|-----|--------|
| ℞ Bromoformi            | - | - | - | - | -   | ʒj.    |
| Tincturæ Bryoniæ,       |   |   |   |   |     |        |
| Tincturæ Grindeliæ,     |   |   |   |   |     |        |
| Tincturæ Nucis Vomicae, |   |   |   |   |     |        |
| Tincturæ Hyoscyami      | - | - | - | - | ana | ʒss.   |
| Alcoholis               | - | - | - | - | -   | ʒvj.   |
| Syrupi Opii             | - | - | - | - | -   | ʒiiss. |
| Syrupi Aurantii         | - | - | - | - | -   | ʒiij.  |

Misce. Fiat linctus. \* Capiat ʒss. nocte manequ.

The doses should be taken as far as possible away from meals, on rising and at bedtime.—(*Bull. gén. de Thér.*)

#### OLIVE OIL IN THE TREATMENT OF HYPERCHLORHYDRIA WITH AMYXORRHŒA.

Amyxorrhœa makes a difference for the worse in the prognosis of hyperchlorhydria and of ulcer. The part played by the mucus is, in effect, that of protecting the walls of the stomach against attack by the gastric juice. Schali, consequently, in order to remedy the absence of mucus, orders olive oil and almond oil. The oil is taken neat before meals, beginning with a dose of 1 cc. (℥xvij.) and increasing by degrees to 15 cc. (ʒss.). The treatment has the additional advantage of decreasing the acidity of the contents of the stomach. It is an excellent adjuvant to dietetic and medicinal treatment.—(*Archives de Maladies de l'Appareil digestif.*)

#### TREATMENT OF PNEUMONIA.

Schutz gives a dose of digitalis at night as soon as pneumonia appears and even before if he has reason to fear its onset. The patient is given every two hours a cachet of 15 g. (gr. iiss.) of camphor in powder. The essential point in prescribing digitalis is not to wait until cardiac asthenia appears. Children should be treated in the same way. When the initial rigor occurs a dose of 15 grains of antipyrine, and on subsequent days half that quantity of phenacetine, form an efficacious method of quieting the patient. Every two hours the wet-pack is applied to the trunk and shoulders. Alcohol is useful because it stimulates the heart and acts as a proteid-sparer. In some cases, bleeding is required, even in cases in which pallor and weakness are



present; but not more than  $3\frac{1}{2}$  ounces of blood must be taken. It has a special effect upon the nervous system and the sensorium. Schutz suggests that it may also produce an unloading in the small circulation. During convalescence it is particularly necessary to examine the pleural cavity.—(*Zeitschrift f. ärztlich. Fortbildung.*)

#### TREATMENT OF FRACTURES OF THE FEMUR IN CHILDREN.

Fractures of the thigh-bone are more frequent than fractures of the leg in children under 10 years of age. The frequency is greater among infants and children just beginning to walk, in whom the leg is never broken. Vivier, writing more especially for the country practitioner, who cannot keep the necessary constant watch upon a small patient fixed up for treatment by extension, strongly recommends the use of a plaster splint, reaching from the pelvis to the foot, in order to immobilize the joints above and below the fracture. The apparatus recommended consists of three "splints" of dressed tarlatan, each consisting of three thicknesses of the material. One, for the pelvis, is cut twice the height of the pelvis, and one-and-a-half times the girth. The other two reach from the iliac spine to the point of the toes, and in width are a little more than half the circumference of the thigh. The child should be anesthetized for the application. This enables the bone to be placed in a good position, makes that easier to obtain, and ensures the maintenance of the position until the plaster is set. As soon as muscular relaxation is obtained, the fragments should be brought into apposition, and rubbed together to disentangle any clot, etc., which may be fixed there. The sleeves of a woollen vest are then pulled over the legs, and the neck is cut away at the level of the crutch. One or two plaster bandages are then applied, from the foot to the lower part of the chest. The pelvic splint is then applied so as to cover a little of the thigh. The other two splints are then placed in position, one in front and the other behind the limb, reaching from the toes to the hip. These are then fixed in place by plaster bandages. After moulding the splint, so as to grasp the protuberance of the hip and thigh, the limb is brought out to a position of abduction of about  $30^{\circ}$  to  $35^{\circ}$ . The foot must be kept at a right angle, and in a median position, neither varus nor valgus. The apparatus is then trimmed up, freeing the toes, the genitals, the anus, and the abdomen sufficiently to allow for the full stomach after meals. The child should not be moved from his bed for three or four days, to allow complete drying. Then he should be taken out of doors to a couch, or in a suitable carriage. After a fortnight he may be allowed to walk about with the help of crutches, but not much weight must be placed upon the foot of the affected side. The plaster can be removed at the end of 30 days, but, when possible, this should be extended to 40. The child is then kept in bed for 3 or 4 days to kick about at pleasure. Massage and passive movements of the knee and hip for a fortnight, with gradual walking, give an excellent result.—(*Journal des Praticiens.*)

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# THE PRACTITIONER.

NOVEMBER, 1909.

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## THE TREATMENT OF INOPERABLE SARCOMA BY BACTERIAL TOXINS (THE MIXED TOXINS OF THE STREPTOCOCCUS OF ERYSIPELAS AND THE BACILLUS PRODIGIOSUS).<sup>1</sup>

By WILLIAM B. COLEY, M.D.,

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THE subject of the treatment of sarcoma with the mixed toxins of erysipelas and bacillus prodigiosus is one upon which I have been working constantly for the last seventeen years, and one which has grown more interesting to me with each succeeding year.

While the results have not been as satisfactory as one who is seeking perfection could wish, they have been sufficiently real and tangible, I think, to be entitled to more careful consideration than they have yet received. Furthermore, they may have an important bearing upon the whole cancer problem, since, if by the administration of certain bacterial toxins we can cause the degeneration, death, and absorption of living tumour cells of one variety of cancer, sarcoma, it is not unreasonable to suppose that by the use of some other forms of bacterial toxins, we may succeed in destroying or inhibiting the growth of the other and more common variety, carcinoma.

At the outset I wish, at the risk of tiring a few of you who may have read and who remember some of my former papers upon this subject, to give in the briefest possible words an outline of the early history of the method of treatment and the several stages of its development, for the benefit of the many who have never heard of the mixed toxins of erysipelas

<sup>1</sup> Delivered before the Royal Society of Medicine.

and bacillus prodigiosus, or whose knowledge of the same is of the most general sort. Such early history of the method is essential for the proper consideration and understanding of its present status.

First, I wish to emphasise the point that the method rests upon a solid foundation of accepted and indisputable clinical facts, namely, that in a considerable number of cases of inoperable cancer of all varieties, and especially sarcoma, such tumours have been known entirely to disappear under attacks of accidental erysipelas and patients have remained well for many years thereafter.

For those who refuse to accept clinical results unless confirmed by laboratory experiments, these latter tests have now been supplied, since, during the last two years, Dr. Martha Tracy and Dr. S. P. Beebé, of the Huntington Cancer Research Fund, have shown that large multiple sarcomas in dogs rapidly disappear under both local and systemic injections with the mixed toxins of erysipelas and bacillus prodigiosus.

My attention was first called to the curative effect of accidental erysipelas in inoperable sarcoma by a certain case observed in 1891. In my studies of sarcoma at that time I made a careful analysis of all the cases of sarcoma (90 in number) operated upon at the New York Hospital during the preceding 15 years. Among these cases was one of a small round-celled sarcoma of the neck, four times recurrent. At the fifth operation, in 1884, Dr. Bull found the tumour to involve the deep structures so extensively that it was impossible to remove it, and he gave up the attempt. The case was regarded as absolutely hopeless, when, shortly after the operation, the man developed a very severe attack of accidental erysipelas in the face and neck, followed, two weeks later, by a second attack. Within a few days after the beginning of the first attack the tumour began to soften and to decrease rapidly in size. The history stated that when the patient left the hospital the tumours had entirely disappeared. There was no after-record of the case, but I made an effort to trace the patient, and finally found him alive and well with no evidence of any local or general recurrence in the spring of 1891, seven years later. He was examined both by Dr. Bull and myself.



At this time I had not read of Fehleisen's experiments in Germany, in inoculating patients with inoperable malignant tumours with the streptococcus of erysipelas; but I was so strongly impressed with the case I have related that I determined to try inoculations in the first suitable case. In a very short time, May 2, 1891, I made my first inoculation, in a case of recurrent spindle-celled sarcoma of the tonsil and neck, kindly referred to me by Dr. William T. Bull. The patient was an Italian, 35 years of age, first operated upon for sarcoma of the tonsil and neck by Prof. Duronto, of Rome, in 1890, and again by Dr. William T. Bull, at the New York Hospital, in April, 1901. The tumour was found much too extensive for removal, but a portion was excised for microscopical examination, which proved it to be a spindle-celled sarcoma. At the time of my first inoculation there was a tumour of the right tonsil, nearly as large as an egg and almost completely blocking the pharynx; there was also a large metastatic tumour in the right cervical region. The patient could take no solid, and but little liquid, food, and was much emaciated and cachectic. The details of this case were published in my first paper, "A Contribution to the Knowledge of Sarcoma" (*Annals of Surgery*, September, 1891; and also *Am. Jour. of the Med. Sciences*, 1893, Vol. 105, p. 487). The history of the case in brief is as follows:--I worked continuously from May to October, 1891, to produce an attack of erysipelas, without success. Cultures from four different laboratories were used and various methods of inoculation were employed. Finally, in October, 1891, with five decigrams of a bouillon culture of streptococcus of erysipelas, just brought me from Koch's laboratory in Germany by Dr. Frank Ferguson, the pathologist of the New York Hospital, a most severe attack of erysipelas developed, nearly causing the death of the patient. Within an hour after the injection a severe chill occurred, followed by a temperature of 105° F. After an interval of 12 hours a typical attack of erysipelas developed, starting at the point of injection and extending over the neck and face. It ran its usual course. The tumour of the neck began to break down on the second day and a discharge of broken-down tumour tissues continued until the end of the attack. At the end of two weeks, the neck tumour had disappeared

and the tonsil tumour had decreased in size. The patient remained well for eight years and then died in Italy from a local recurrence.

During the next two years, through the kindness of Dr. Bull, I had an opportunity of trying the inoculations upon a number of chronic and incurable cases of malignant disease at the New York Hospital, in a special building erected for the purpose by Mr. Archer M. Huntington.

It is necessary to refer to these earlier investigations with the inoculations of the living cultures, inasmuch as they form the basis of all the later work with the toxins.

Of the first 10 cases treated by the living cultures (local and systemic injections of bouillon cultures of the streptococcus of erysipelas) six were sarcoma and four carcinoma, all inoperable and far advanced. In seven of the ten cases I could not produce erysipelas after many attempts extending over many weeks. In all these cases of failure to produce erysipelas, however, I noticed slight temporary improvement in the tumours as shown by decrease in size, increase in mobility, and diminution of vascularity. In only three cases of sarcoma was it possible to produce an active attack of erysipelas; one of these I have already related in brief. The second was a large inoperable sarcoma of the back (mixed-celled) with extensive metastases in the right groin, in a man 46 years of age. The tumour of the groin was partially removed, but it recurred quickly. Specimens from the primary tumour of the back were excised and pronounced mixed-celled sarcoma by Dr. Frank Ferguson, pathologist to the New York Hospital, and the diagnosis was confirmed by microscopical examinations made by a number of other pathologists. I first inoculated the patient on April 21, 1892. Injections with the living bouillon cultures of the streptococcus of erysipelas, obtained from the laboratory of the College of Physicians and Surgeons, were repeated daily for three weeks without causing an attack. In the fourth week an injection of 20 mm. of a fresh culture obtained from the Johns Hopkins Hospital Laboratory, was given without effect. A second injection, two days later, was followed by a severe chill and a temperature of  $105.5^{\circ}$ . Twenty-four hours later, a typical area of erysipelas developed. To quote from my paper (*loc. cit.*, 1893):—"From the begin-

ning of the attack, the change that took place in the tumour was nothing short of marvellous. It lost its lustre and colour, and had shrunk visibly in size within twenty-four hours. Several sinuses formed the second day and discharged necrosed tumour tissue. A few days later the tumour of the groin, which was about the size of a goose egg and very hard when the inoculations were begun, broke down and discharged a large amount of tumour tissue. Three weeks from the date of the attack of erysipelas both tumours had entirely disappeared. July 1, two months later, there was a small local recurrence in the back. Two weeks later six small nodules had developed. Inoculations were resumed, but no attack of erysipelas could be produced until November 14, 1892, although constant attempts were made. By October 1 the tumour had been  $2\frac{1}{2}$  by  $4\frac{1}{2}$  inches, and by November 14, 5 by  $3\frac{1}{2}$  inches, and there was a marked recurrence in the groin. On November 14, after an injection of 22 mm. of a culture previously used without effect, a moderately severe attack of erysipelas developed, during the course of which the tumours both in the back and groin disappeared. In two weeks there was evidence of recurrence. Curiously, during the next three months three further attacks of erysipelas developed spontaneously; they were milder in character, and the effect upon the tumours was less pronounced and less lasting." Finally, early in 1893, under repeated injections of the mixed toxins of erysipelas and bacillus prodigiosus, the tumour disappeared, and the patient remained well for  $3\frac{1}{4}$  years, when he died from a malignant tumour of the abdomen, probably metastatic.

The third case of sarcoma in which I produced an attack of erysipelas was a twice recurrent sarcoma of the breast in a woman 38 years of age, referred to me by Dr. Bull. An inoculation, given June 2, 1892, resulted in a moderately severe attack of erysipelas. All of the three tumours present decreased considerably in size; one almost disappeared. A second attack of erysipelas was produced on June 30; the tumours showed some further improvement, but less than from the first attack. The check in growth proved but temporary and the tumours soon began to increase in size. In spite of further inoculations the patient grew worse and died



within six months.

In none of the cases of carcinoma did I succeed in producing erysipelas.

Although up to this time I had had no death, the difficulties in the way of successful inoculations were very great.

Shortly afterward I had two deaths, both in far-advanced cases, and the patients had been duly warned of the risks of inoculation.

These experiments with the living cultures, while absolutely confirming the curative influence of accidental erysipelas, as shown by clinical observation, also emphasised the practical difficulties which had been sufficient to cause Fehleisen to abandon his attempts.

I had learned from the same source—

1. That it was extremely difficult to produce erysipelas at will.
2. That the risks of inoculation when successful were considerable.
3. And, most important, I had been impressed with the fact that repeated injections of the living bouillon cultures of the streptococcus of erysipelas had an inhibitory action upon the growth of the tumours which, while only temporary, was nevertheless distinct.

This fact led me to believe that a portion at least of the curative action (property) of the erysipelas lay in its products, which might possibly be utilised without producing an actual attack of erysipelas.

In the latter part of 1892 I made my first experiments with the toxins of erysipelas. I began with bouillon cultures of the streptococcus of erysipelas, sterilised by just sufficient heat ( $58^{\circ}$  C.) to destroy the germs, and also by filtering the unheated cultures through a porcelain filter. These toxins were prepared for me by Dr. Alexander Lambert.

Four cases of inoperable sarcoma were treated by this preparation, with constitutional reactions very similar to those obtained from the living cultures. The temperature would rise to  $103.5^{\circ}$ , but would always fall to normal on the following day. There was some inhibitory action on the tumours, but this was temporary. I obtained cultures from fatal cases of

erysipelas in order to get the highest degree of virulence.

At this time Roger's experiments with the prodigious cultures showed that if the bacillus prodigiousus were grown together with the streptococcus of erysipelas the virulence of the latter was materially increased. Roger had never used the bacillus prodigiousus alone or with the streptococcus of erysipelas on the human being and had never, as far as I know, suggested it as a therapeutic agent.

In order to intensify the virulence of the erysipelas I decided to use the combined toxins of erysipelas and bacillus prodigiousus, growing the two organisms together and sterilising them with heat.

The first preparation was made for me by Dr. B. H. Buxton, then Fellow of Bacteriology of the Loomis Laboratory and now for seven years Professor of Experimental Pathology of Cornell University. The erysipelas culture was grown alone in bouillon for 10 days, and then the bacillus prodigiousus was added; the two were grown together for 10 days, and then were sterilised by heating to  $58^{\circ}$  C. and kept sterile by the addition of a little thymol.

This is the preparation that was used with little change until three years ago, when Dr. Martha Tracy, working with Dr. Buxton, suggested an important modification.

Her subsequent experiments proved the truth of the opinion that I had already expressed some time before, based upon clinical observations alone, that the bacillus prodigiousus had in itself a curative effect upon tumours, independently of any action it might have in intensifying the virulence of the erysipelas.

Tracy's first experiment with the bacillus prodigiousus alone confirmed the investigations of Vaughan of Ann Arbor, that the bacillus prodigiousus toxins were the most powerful known. Further experiments with sarcoma in dogs showed that sarcoma would disappear under the injections with the prodigiousus alone, without any erysipelas, although not quite so rapidly as when the combined toxins were used.

Utilising these newly-proven facts, Dr. Tracy proceeded to grow the two organisms separately, and, by adding a certain quantity of the sterilised prodigiousus bouillon to each ounce of the streptococcus broth, was able to secure what

had never been possible before, namely, a definite standardisation of dosage. This enabled us to overcome the greatest difficulty we had had to contend against all along.

In the old way of growing the two organisms together there had always been a varying amount of prodigious toxins in the solution, due to an exceedingly variable rate of growth. I had previously noted clinically that the highly-coloured solution of the toxins, showing a large amount of prodigious present, was more powerful, and, likewise, that the curative effect was greater. The first preparations which Dr. Tracy made in the way described had so large an amount of prodigious that very severe reactions were obtained by minute doses, and, in one case, in the hands of another physician, death resulted within a few hours after an injection of  $\frac{1}{4}$  mm. made into a very vascular tumour in the mediastinal region. After this the addition of the prodigious to the toxins was immediately reduced to one half, and this amount has been continued up to the present time.

The process of preparation is as follows:—

*To prepare the streptococcus broth.*—Soak 1 lb. of minced beef overnight in 1,000 (one thousand) cc. of cold water. Then boil for one hour and filter through coarse cotton cloth of any sort. Add of peptone (Witte's), 10 gm.; of NaCl (sodium chloride), 5 gm. Test the reaction to litmus and render slightly alkaline by addition of a sufficient quantity of 10 per cent. NaOH (sodium hydroxide) solution. Boil for one hour. Filter through filter paper. Distribute into small flasks, 25 to 50 cc. in each flask. Sterilise by boiling for one half hour on 3 (three) successive days. Sow each flask with a few cc. of a broth culture of streptococcus.<sup>1</sup> Allow to grow in the incubator for three (3) weeks.

*To prepare the prodigious suspension.*—Spread an ordinary 2 per cent. agar medium to a depth of about 1 cm. at the bottom of a large "Roux" or "anti-toxin" culture flask. Sterilise as usual by boiling for one half hour on three successive days. Over the surface of the agar, with the usual precautions against contamination, pour a two-days' old broth culture of bacillus prodigiousus.<sup>2</sup> Manipulate the flask so that the entire agar

<sup>1</sup> The streptococcus used during the past two years, in the Laboratory of the Huntington Cancer Research Fund, was isolated from a fatal case of septicæmia. It is doubtful whether an organism from an actual case of erysipelas would give any better results. The stock culture of streptococcus has been maintained more satisfactorily in broth than on agar. No attempt has been made in recent work to keep up the virulence by passing through animals.

<sup>2</sup> The stock culture of prodigious is kept upon agar slants, a tube of broth being inoculated from the agar two days before it is needed for the large flasks.



surface has been touched by the broth, and drain off the surplus fluid. Allow the prodigious to grow at room temperature in daylight, but protected from the direct sunlight, for ten days. Scrape off the thick red growth with glass rods and rub up with a pestle and mortar to a smooth, rather thick, suspension, using physiological salt solution as diluent. Bottle and sterilise in the bottle, by heat at 75° C., for one hour. This suspension can be diluted further at any time. The amount of diluent needed is ascertained by determining the weight of nitrogen per cubic centimeter of suspension (Kjeldahl's method). This multiplied by 6.25 gives the weight of the proteid present, and this should be 12.5 mgm. per cubic centimeter of the suspension to be used for the mixture.

*To prepare the mixture.*—Take of streptococcus broth culture, three weeks' growth, 100 cc.: of prodigious suspension (containing 12.5 mg. of proteid per cubic centimeter or 375 mg.<sup>1</sup> of proteid in all, 30 cc.: of glycerine, 20 cc.

Each cubic centimeter of the mixture then contains 2.5 mg. of prodigious proteid.

After mixing, bottle in glass-stoppered bottles. Add a small piece of thymol (size of pea to 1 oz. bottle) to each bottle and sterilise two hours at 75° C. Keep on ice.

First a further word upon the clinical observations or accidental erysipelas in inoperable tumors. In one of my earlier papers, "The Treatment of Malignant Tumours by Repeated Inoculation of the Living Germ of Erysipelas," I collected 38 cases of malignant tumours (sarcoma and carcinoma) in which an attack of erysipelas had occurred, either by accident or by inoculation. In 23 cases the attack was accidental, and in 15 the result of inoculation. Seventeen were sarcoma, 17 carcinoma, and in 4 cases the type of tumour was not stated. Of the 17 cases of carcinoma 3 were permanently cured. One, a probable carcinoma, was well five years after the attack of erysipelas. The remaining 13 showed more or less temporary improvement. Of the 17 cases of sarcoma, 7 were well from 1—7 years afterwards. In the remaining 10 cases nearly all showed improvement, some disappearing entirely and later recurring.

In the *American Journal of Medical Sciences*, 1906, I published six other cases of cancer—five of epithelioma and one of sarcoma—in which an attack of erysipelas had intervened in the course of the disease:—

(1) Recurrent cancer of the breast. Patient well nine

<sup>1</sup> It was found desirable to reduce the amount of prodigious proteid to one half of the amount shown in the formula given in my paper, published in the *Medical Record* of July 27, 1907.

years.

- (2) Sarcoma of the neck (entire disappearance). Patient well eight years.
- (3) Epithelioma of the face, 18 years' duration (entire disappearance). Local recurrence several years later. Again disappeared under one month's treatment with the toxins. Probable recurrence six months later.
- (4) Epithelioma of the face, lip, and nose. Disappeared under very severe attack of erysipelas. Patient well two years later, when he died from another trouble.
- (5) Epithelioma of the face of two years' duration. Entire disappearance under attack of erysipelas. Patient well at last observation six months later.
- (6) Epithelioma of nose, eight years' duration. Entire disappearance under attack of erysipelas. Patient well several years later.

#### THE ACTION OF THE MIXED TOXINS UPON INOPERABLE SARCOMA.

The macroscopical as well as the microscopical changes observed by myself and others have been precisely the same as those formerly noted in cases of sarcoma treated by inoculation of the living germ. First, the tumour becomes much paler owing to decreased vascularity; secondly, it becomes much more movable and less fixed to the surrounding tissues, these changes being often noted after the first 2-3 injections; thirdly, it soon begins to show areas of softening, due to caseous degeneration or necrobiosis of the tumour elements; fourthly, gradual disappearance, either by absorption—which is more apt to be the case in the firmer tumours, *e.g.*, spindle-cell—or fibro-sarcomas; or, in other cases, especially the round-celled and vascular varieties, by breaking down and liquefaction of the tumour tissue. In such cases incision and drainage may be sometimes advisable, provided the tumours are in accessible regions.

These changes are precisely the same, whether the toxins have been injected directly into the tumour or whether the injections have been made in remote parts of the body,

proving that the action of the toxins is systemic rather than local.

In a certain number of cases—in my own experience in a little over 10 per cent.—the degenerative process has gone on until complete absorption of the tumours has taken place and the patients have remained cured.

In other cases improvement is only temporary and after a few weeks, in spite of continued injections and increased doses, the tumour again begins to show signs of growth and continues until a fatal issue.

In a very few instances, especially in cases of very large and vascular tumours, particularly the melanotic type which of late many pathologists are inclined to class as carcinoma instead of sarcoma, no marked beneficial effects have been noted at any time.

What is the explanation for these variable results? Why should the toxins behave so differently in these cases, causing some of the very worst and most hopeless ones to become permanently cured, and in others showing little or no effect?

The explanation is, I think, not so very difficult. My own belief, expressed 16 years ago and held more firmly with increasing clinical experience, is, that all varieties of malignant tumours are of extrinsic or microbic origin. Just what type of organism this may be, whether bacterium, protozoan or spirochete, or what not, is of little consequence. Assuming such origin, we have but to follow the analogy of other diseases of known germ origin. We know that in all such diseases there is a natural immunity and an acquired immunity. In the case of malignant tumours there is probably a natural immunity which is very great, but in certain cases it is absent or becomes lowered and the germ finds a favourable site and here starts the primary malignant tumour.

The important rôle that trauma or injury plays in the development of malignant tumours, now accepted by all authorities, can, to my mind, but be explained on the theory of microbic origin. Trauma plays a precisely analogous part in the development of bone tuberculosis. Some writers, *e.g.*, Tilmanns, going so far as to state that most cases of bone tuberculosis follow an antecedent injury, the bacilli, of course, being present in the circulation prior to the injury, but that a



naturally existing immunity or resisting power of the tissues had been sufficient, up to this time, to prevent any local infection. The injury, lowering this local resistance of the tissues, furnishes precisely the conditions favourable for the growth and development of the bacilli. Hence the origin of the tuberculous lesion.

I could cite many striking cases of sarcoma of the most virulent type that followed immediately upon a blow or an injury to the bone in previously perfectly healthy individuals. The ætiology of tumours is a problem far too difficult and complicated to more than touch upon here.

Assuming such extrinsic origin, the action of the toxins appears to me to produce certain changes in the blood serum that restore the weakened or lost immunity, or natural resisting power of the tissues, and the sarcoma cell, no longer finding conditions favourable for further growth and development, undergoes a process of degeneration, with absorption in some cases, and the formation of a slough in others.

The reason why a cure results in some cases is that in these the antagonistic action of the toxins is sufficient to destroy the cancer cell and to render the soil unfavourable for further growth; whereas, in other cases, the tumour cells, by reason of greater vigour or better nourishment, are more resistant, and, although receiving a temporary set-back by reason of the changes in the blood produced by the toxins, soon accommodate themselves to the new environment and continue to grow as before.

The high temperature produced by the toxins may also be a factor in causing the improvement that follows their use. Many and repeated blood examinations of sarcoma patients treated with the toxins show almost universally a marked leucocytosis as a result of the treatment.

That the tumour cell is ever in a delicately balanced state is shown by the experimental investigations upon mouse cancer during the past four years. A certain strain of carcinoma was found to grow well in Berlin mice, but would not grow at all, or in few cases only, in Danish mice of the same breed. To quote a recent and unpublished paper of Dr. James Ewing:—"Apparently slight differences in the food-supply sufficed

to render the soil unfavourable to the tumour cell. These remarkably delicate nutritional requirements of the cancer cell suggest that some means may be found to render the human patient's tissue unfavourable for cancer growth," and this is exactly what, in my opinion, the toxins do in sarcoma.

#### INDICATIONS FOR THE USE OF THE TOXINS.

While in all my earlier papers I have practically limited the use of the toxins entirely to cases of inoperable sarcoma, further experience has convinced me that they have a much wider field of usefulness. I would at present advocate their use, first, in all cases of inoperable sarcoma, except the melanotic, which are classed as of epithelial origin by many pathologists. Secondly, in cases of sarcoma originating in the long bones, in which operation means a sacrifice of the limb; if in these cases no improvement is noted at the end of 2—3 weeks, I would then advise excision, resection, or amputation, according to the individual case. Thirdly, in all cases of operation for primary sarcoma, directly after wound healing, as a prophylactic against recurrence. Fourthly, in addition to the foregoing, I think there is good ground for believing that the use of the mixed toxins after all operations for carcinoma would greatly lessen the number of recurrences. This opinion is based partly on the clinical observations of a considerable number of cases in which both epithelioma and carcinoma have entirely disappeared and been permanently cured from attacks of accidental erysipelas, and partly upon the marked inhibitory action of the mixed toxins upon inoperable carcinoma, as shown by actual experiments in a large number of cases.

#### THE CAUSE OF THE TOXINS IN SARCOMA OF THE LONG BONES.

In a recent paper upon "The Conservative Treatment of Sarcoma of the Long Bones," read before the American Medical Association, I gave a detailed study of 92 cases of sarcoma of the long bones that had come under my personal observation within the last 18 years. I stated: "The facts I have set forth are sufficient in my judgment to justify the giving up of the traditional method of treating all cases of sarcoma of

the long bones by immediate amputation. In most cases I believe it safe to wait for two to three weeks, the time required for a trial with the toxins, before sacrificing the leg. Sarcoma cases of extremely rapid growth will probably show little or no effect from the toxins, and one might (naturally) say valuable time had been lost by the preliminary use of the toxins. However, it is my opinion that early operation in these cases would not have been of the slightest avail, as shown by the long, almost unbroken, list of fatalities of cases treated by operation alone. On the other hand, in certain cases—probably a small number—the limb will be saved by the preliminary use of the toxins. In those in which early improvement is not marked, operation can then be performed with even greater chances of ultimate success, than had the toxins not been first used.

“The greatest value of the toxins in sarcoma of the long bones will, I believe, be shown to lie in a judicious combination with conservative operative treatment. By such procedure hip-joint amputation, which has been the almost uniform rule for sarcoma of the femur, will give place to an amputation below the trochanter, which will leave a stump of sufficient length to permit the wearing of an artificial limb, and this is no small gain. The toxins will be administered for a considerable period of time after amputation with the hope of destroying the cells which were left behind and which, with operative treatment alone, cause the local and metastatic recurrences. The same rules will apply to sarcoma of the humerus.

“Coming to sarcoma of the tibia, fibula and radius and ulna, particularly of the myeloid type, in place of amputation, as formerly advised and still advocated by the great majority of surgeons, we can safely substitute either curetting or partial resection, followed by a thorough course of the mixed toxins. While good results have been obtained in a very limited number of cases in this group by operation alone, I am convinced that the number of successes will be greatly increased by combining the toxin treatment with conservative operation, as I have suggested, and my series of cases strongly supports this opinion.

“An earlier diagnosis is steadily but surely coming, owing to



increased knowledge of this disease, coupled with more correct interpretation of X-ray plates, and the use of earlier exploratory operations, the conservative treatment along the lines I have mentioned, will soon show results infinitely superior to those obtained by the radical and maiming operations thus far almost uniformly practised."

#### THE TOXINS AS A PROPHYLACTIC AGAINST RECURRENCE AFTER OPERATIONS FOR PRIMARY SARCOMA.

The use of the toxins as a prophylactic after operations for sarcoma I believe to offer by far the most important field of all, and one that is gradually being appreciated by the profession. At the Mt. Sinai Hospital in New York the toxins are now used by Dr. Gerster and Dr. Lilienthal in all inoperable cases of sarcoma as well as a prophylactic after operation for primary sarcoma, and many others are beginning to use them in this way. I have already a sufficient number of cases of sarcoma in which I have used the toxins as a prophylactic measure to justify such use.

#### THE TOXINS AS A PROPHYLACTIC AGAINST RECURRENCE AFTER PRIMARY OPERATIONS FOR CARCINOMA.

While I have not sufficient data to enable me to speak emphatically in regard to carcinoma, I believe the inhibitory action of the toxins upon carcinomatous cells—sufficient in an insignificant number of cases to cure a large inoperable tumour—to be sufficient to prevent recurrence in a considerable number of cases if used after operation. I have had one case in an inoperable epithelioma of floor of mouth and lower jaw. When used as a prophylactic measure in the way I have indicated, I believe the toxins to be entirely devoid of risk. No deaths have occurred in the cases in which the treatment was used as a prophylactic. In these cases the dose given is smaller and it is not increased to the point of producing severe reactions; a moderate temperature of 99–101° is all that is required. This will not in any way interfere with the ordinary routine of life. The toxins can be given for long periods of time without any harmful effects, as is shown by a case eight times recurrent sarcoma of the chest-wall in which the treatment was continued for

four years and the patient is now well, 14 years after the beginning of the treatment or 10 years after its cessation. The treatment did not in the least interfere with his regular work.

I have several other cases in which the toxins were given for two years or more without any unfavourable effects.

#### DURATION OF TREATMENT.

It is very hard to lay down any definite rules as to the duration of treatment that would apply to all cases. My own feeling, based upon my experience up to the present date, is that there is much more danger in stopping the toxins too soon, than in giving them too long. That they can be given for very long periods without harm is shown by some of my cases, one patient in particular having taken the toxins, with intervals of rest, for a period of nearly 4 years. He had had 8 operations for recurrent spindle-celled sarcoma of the chest-wall. At each operation the tumour had become more malignant, and the case was considered quite hopeless from the standpoint of further operations. The treatment was given in small doses which, after the first few weeks, did not interfere with the performance of the patient's duties as a surgeon. He is to-day in perfect health, 14 years after the beginning and 10 years after the cessation of the treatment. In many of the prominently successful cases the toxins have been given for comparatively short periods—six weeks to three or four months. One, an inoperable sarcoma of the abdominal wall, had only 31 injections and entirely recovered, and was well when last seen, 1½ years later. Another case, an inoperable sarcoma of the abdominal wall, spindle-celled, pronounced hopeless by Professor Maurice H. Richardson, of Harvard Medical School; diagnosis confirmed by microscopic examination by Professor Whitney; disappearance of the tumour under four months' treatment in the fall of 1894. The patient is to-day in perfect health, 15 years later.

Another case, an inoperable sarcoma of the breast, axillary glands and pectoral muscle, the diagnosis confirmed by Professor W. H. Welch, of Johns Hopkins, the tumour disappeared after 78 injections—1895—and the patient is still in perfect health. I presented her before the Medical Society of New

York in February 1909, 14 years later.

Another case of inoperable sarcoma of the abdominal wall and pelvis involving the bladder was treated with the toxins for six months—January 1893. The tumour entirely disappeared, and I presented the patient before the New York Surgical Society in 1898 in perfect health, 15 years later. In this case the patient had been pronounced inoperable by Dr. L. Bolton Bangs, and the diagnosis of spindle-celled sarcoma was confirmed by Dr. H. T. Brooks, Professor of Pathology at the Post Graduate Medical School.

In a few cases there has been a recurrence of the tumour after it had once disappeared under the toxin treatment, and I feel that had the toxins been given for a longer time a cure might have resulted. My first case of sarcoma of the neck and tonsil, recurrent and inoperable, was treated with living cultures, finally resulting in a severe attack of erysipelas. The tumours nearly disappeared, and the patient entirely recovered his general health, but finally died eight years later from a local recurrence.

In another case of extensive sarcoma of the back with large metastatic tumours in the groin, the tumours entirely disappeared under living cultures of erysipelas. Recurrence quickly followed, but finally disappeared under the injections of the toxins. The patient remained well for  $3\frac{1}{4}$  years, when he died from abdominal metastases.

With a very few exceptions (four or five), in all cases in which the tumours have disappeared under the toxin treatment the patients have remained well. These few cases of recurrence furnish convincing evidence of the undoubted influence of the toxins upon sarcoma, inasmuch as they absolutely prove that, in these cases at least, there could have been no error of diagnosis. Can we then form any practical rules to guide us as to how long the toxins should be administered? I would say, Give the toxins until the tumours have entirely disappeared, and then continue in smaller doses and greater intervals for three or four months longer. If no improvement is noted at the end of four or five weeks a successful result is not likely to occur, and retardation of the growth is all that can be expected from a further use of the toxins.

Much depends upon a judicious determination of the dosage



for a given case. As a rule I like to give as much as the patient can safely stand. I always begin with one-fourth of a minim, diluted with sufficient boiled water to ensure accuracy of dosage, injected either into the buttocks or pectoral region. After the individual's susceptibility has been ascertained, one can inject into the tumour itself, if it is in an accessible region. The initial dose into the tumour should always be less, not more than one-fourth of that used elsewhere. I believe it a good plan to give the injections alternately into the tumour and into the buttocks. Daily injections should be given, increasing by one-fourth of a minim until the desired reaction, namely, a temperature of  $102-104^{\circ}$  F., has been obtained. This should be modified to suit patients in a weakened condition. Having secured the desired reaction, the dose should no longer be increased until it fails to give a reaction, when it can again be increased by one-fourth to half a minim. The dose varies greatly with different individuals: the highest dose ever given, in many of the cured cases, has been 7 to 10 minims. On the other hand, the case of spindle-celled sarcoma of the sternum and cervical glands (microscopic examination by Dr. James Ewing, Professor of Pathology, Cornell University Medical School) showed little improvement until large doses as high as 30 minims had been given directly into the tumour. The treatment was carried out by another physician, Dr. David John, of Yonkers, New York, under my direction. The tumours entirely disappeared, and the patient is still well, nearly three years later. I presented her before the New York Surgical Society a year ago. I have at present under treatment, at the Hospital for Ruptured and Crippled at New York, a little girl, 6 years of age, with a three-times recurrent sarcoma of the face, in which the dose was carried up to 20 minims injected directly into the tumour, before a marked reaction was obtained. She has now taken the toxins for nearly four months, and under these large doses has shown very marked improvement. When I left, the tumour had nearly disappeared, and I am hopeful of a cure. On several occasions the toxins were stopped for a few days, and each time there was a rapid increase in growth. I have never seen a case in which the inhibitory action of the toxins upon sarcoma has been more beautifully demonstrated, whether a

cure result or not.

The greatest obstacles to a fair trial of the toxins up to the present time have been—(1) the difficulty of obtaining a preparation of the toxins of uniform standard of strength and efficiency. I will here state that all of my results have been obtained from toxins prepared by Dr. B. H. Buxton, Professor of Experimental Pathology, Cornell Medical School, from 1893–1906; from 1906 to the present time by Dr. Martha Tracy, Assistant Pathologist to the Huntington Cancer Research Fund, who received personal instructions from Dr. Buxton in the method of preparing the toxins. Dr. Tracy's own modification of the method of preparation, by means of which it has been possible to standardise a dose, is a marked step in advance. The preparations before this time were much more variable in strength and efficiency. (2) The published failures of a few men who have given the method a limited and most imperfect trial, usually with a preparation of the toxins entirely different from that used by myself. (3) The number of cases of sarcoma is so limited that the ordinary physician or surgeon sees not more than one or two cases a year; even in large hospitals there may not be seen more than five or six cases a year and these are chiefly operable cases. In these the tumour is removed, and the patient is sent home until, later, when a recurrence has taken place, he is again sent to the hospital. If operable the tumour is again removed, if not he is sent home and his physician advised to make his end as comfortable as possible.

Occasionally, the physician has heard of the use of the mixed toxins in such cases; if he has read of the method he has probably forgotten the details, and has little faith in its value. Now and then a surgeon is found who takes the time to give the matter special thought, and who is willing to give the patient the benefit of a trial with the toxins. He begins with some fears and more doubts, and when he sees the patient in one of the severe chills, sometimes with marked cyanosis, very rapid and feeble heart-action, with a temperature of  $103-105^{\circ}$ , he hesitates to go on, or is unable to instil into the patient the courage and confidence so necessary to enable him to continue the treatment to a successful termination. For these or other reasons, injections are stopped and the treatment

is pronounced a failure.

THE RISKS OF THE TREATMENT HAVE BEEN UNDULY  
EMPHASISED.

While I have personally found the administration of the mixed toxins practically free from danger, there have been several fatal cases in the hands of other physicians brought to my notice, which, taken together, show that there are certain risks connected with the treatment. If, however, the precautions which I have always carefully emphasised in former papers be observed, these risks, I believe, will be reduced to a minimum. Most of the fatal cases that have occurred have been due to a neglect of these precautions.

In my own experience, in nearly 500 cases, there have been only three deaths. In the majority of the fatal cases thus far observed death was apparently due to an embolism. This was the cause in two of my own cases, and in both instances the general condition of the patients was extremely bad; there was generalisation of the disease and very marked involvement of the mediastinal glands. In both cases the patients had only very small doses of the toxins, which were not pushed to the point of giving any marked reactions.

Most of the deaths in the hands of other men have been due, I believe, to too large an initial dose, given directly into a vascular primary growth. In recent years I no longer inject the initial dose directly into a tumour, but first test the individual susceptibility of the patient by systemic injections in the buttocks or pectoral region; after a few such injections, local treatment may be begun, always starting with a minimum dose. I rarely give more than  $\frac{1}{6}$  mm. into the tumour in children, especially if situated in the neck or mediastinum, and never more than  $\frac{1}{4}$  mm. in adults. I have seen a temperature of  $105^{\circ}$  result from  $\frac{1}{8}$  mm. injected into a large cervical tumour in a child. In one of the fatal cases in the hands of other men, death resulted from an injection of  $\frac{1}{4}$  mm. of Dr. Tracy's early preparation (twice as strong as at present) directly into a mediastinal tumour. This was an elderly woman of very feeble vitality.

Another case, recently brought to my notice by the physician in charge, contains an important lesson, *i.e.*, that



the toxins should never be administered by any physician who is not willing to give sufficient time—I will not say to thoroughly read all of the literature connected with the treatment, but at least the directions upon the bottle. In this case the initial dose was 5 mm., injected into a vascular tumour. The physician stated that he had turned the case over to his assistant, who gave the patient 5 mm. and death took place in 15 minutes. Death might also have resulted had he given him 20 grains of morphine, though perhaps not so quickly. The toxins are, indeed, like strychnine and morphine—safe if judiciously and intelligently administered, but exceedingly dangerous if given in the way described.

I have known of another instance—a case of sarcoma of the lower jaw—in which, after two operations had been performed and it was not thought that the disease had been entirely removed, the toxins were advised immediately after operation. In this case, also, the treatment was turned over to an assistant. Although never within the last fifteen years have the directions sent out with the toxins called for larger initial doses than  $\frac{1}{4}$  or  $\frac{1}{2}$  mm., the assistant in this instance proceeded to give 20 mm. as a first dose. This was some years ago, when the preparation was considerably weaker than at present, at least its strength was more variable. Although the patient went into coma and remained comatose and delirious for some time, he finally recovered and is well now, two years afterward, the tumour of the jaw having been cured.

In a few other cases, however, in which death resulted, the ordinary precautions had apparently been carried out. One such case was seen by myself in consultation and the treatment advised and a general outline of the dosage given. This was a woman, 55 years of age, with a very large vascular sarcoma of the ilium. Her general vitality was much impaired and circulation was not good. The toxins were begun in minute doses,  $\frac{1}{4}$  mm., and gradually increased up to the point of reaching a temperature of  $103-4^{\circ}$ . After about two weeks' treatment an injection of 12 mm. caused a severe chill; the patient became very weak and exhausted and did not recover.

In this case, had I had personal charge of it, I have no doubt that, seeing that she did not bear the toxins well and that the

temperature remained high, I should not have increased the dose as rapidly as was done.

Each case must be treated on its individual merits. In one case death resulted from increasing materially a dose which, the day before, had already produced a severe reaction, the patient still having a temperature of  $102^{\circ}$  at the time the injection was given. It is a very good rule not to repeat injections as long as the patient has any material rise of temperature, but to wait until the latter has fallen to normal or nearly normal. After the desired reaction is obtained, causing a temperature of  $102-3-4^{\circ}$ , according to the vitality of the patient, one should not increase the dosage until it has failed to produce such reaction.

I have never known of a fatality from the use of the toxins as a prophylactic after operation, nor of any dangerous symptoms.

#### FINAL RESULTS.

Up to the present time I have had 52 cases of inoperable sarcoma successfully treated with the mixed toxins of erysipelas and bacillus prodigiosus. Of these, 35 have remained well from  $3\frac{1}{4}$  to 16 years; 28, from 5-16 years; and 14, from 10-16 years. To the 36 successful cases published in the *Am. Jour. of the Med. Sciences* in March, 1906, I have been able to add 16 others.

In the first 36 cases reported in 1906 there was, in addition to the tumours being adjudged inoperable by leading surgeons, a careful microscopical diagnosis made in all but two instances. One of these cases was a large tumour of the sacrum, pronounced to be sarcoma and inoperable by the attending physicians and surgeons of St. Luke's Hospital of New York. The patient had lost 40 lbs. in weight and could not walk without assistance. The tumour entirely disappeared under two months' treatment with the mixed toxins; in three months the patient who had regained his normal weight resumed his work. He is well at the present time, 14 years later. The other case was a large inoperable tumour of the right iliac fossa, highly vascular, pronounced to be sarcoma by Dr. Fowler of Brooklyn, after an exploratory laparotomy. The tumour disappeared under the toxin treatment and the patient re-

mained well for eight years, when he died from another disease.

The majority of these cases have been shown from time to time before the New York Surgical Society, one of them 16 years after treatment. At the Hartford Medical Society last year I showed three cases, all of residents of Hartford, one an enormous sarcoma of the gluteal region; well 14 years; was recurrent and had been pronounced inoperable by Dr. Charles McBurray when I began the treatment. The second case was a spindle-celled sarcoma of the breast and pectoral region, diagnosis confirmed by Dr. W. H. Welch, of Johns Hopkins Medical School, treated under my direction at Hartford; well 14 years. The third case was a round-celled sarcoma of the tonsil and larynx, with metastases in both cervical regions. Entire disappearance under six months' treatment; well at present, nearly three years afterwards. Diagnosis confirmed by microscopical examination, Cornell Medical Schools, February.

In my paper of April, 1906, *Am. Journ. of Med. Sciences*, I tabulated the successful cases of other men, 60 in number. Since that time, from personal communications and published reports, this number has greatly increased until now I believe that considerably more than 100 cases have been successfully treated by other surgeons. I am much gratified to find two successful cases recently reported in *The Lancet*, March 20 and May 22, 1909.

At a recent meeting of the Medical Society of Greater New York I showed eight patients who had been treated for inoperable sarcoma with the toxins, and in three of the eight the limbs, leg in two cases and arm in the other, had been saved from amputation. Seven cases well from 2—14 years and the eighth is well over one year.

In the discussion of these cases certain criticism was offered by a surgeon, which is typical of the sort of criticism the method received in former days, but which has become less and less frequent in recent years.

No criticism was made as to the accuracy of the diagnosis in these cases, nor of the fact that the tumours disappeared and the patients themselves were in perfect health. The patients were present as visible proof of the latter fact, but this was the line of reasoning: The treatment, if of the



value claimed, should—after 15 years—have become generally accepted all over the world and universally adopted. The critic had just returned from Europe and he stated that the treatment was not generally used or accepted there—ergo, it could not be of value. Furthermore, the critic had himself tried it in a certain number of cases many years ago, and had not obtained the same results as myself.

I will leave the answering of such arguments to others with greater love for disputation than myself. I will only call attention to one fact, apparent to any one familiar with the history of medical discoveries, and that is that the relative value of such discoveries bear not the slightest relation to the rapidity of their acceptance by the medical profession. Numerous examples will doubtless occur to you, but few more striking than the one cited by Dr. Eccles in his admirable address on Darwinism and malaria (*N. Y. Med. Record*, January 16, 1909).


In conclusion I cannot do better than quote from a recent and unpublished paper of mine:—"It is natural that any new method of treatment of disease should stand a certain definite test before it can hope to secure recognition. When it comes to the consideration of a new method of treatment for malignant tumours, we must not wonder that a profession, with memories overburdened with a thousand and one much-vaunted remedies that have been tried and failed, takes little interest in any new method and shows less inclination to examine into its merits. Cold indifference is all it can expect, and rightly too, until it has something beside novelty to offer in its favour. Sixteen years ago, when I began to use the toxins for inoperable sarcoma, I did not expect the profession to adopt the method. I was perfectly willing to wait until its great objection of novelty had given way to time and my own results had been duplicated and confirmed by other observers. No one could see the results I saw and lose faith in the method. To see poor hopeless sufferers in the last stages of inoperable sarcoma show signs of improvement—to watch their tumours steadily disappear and finally see them restored to life and health, was sufficient to keep up my enthusiasm. That only a few, instead of the majority, showed such brilliant results did not cause me to abandon the method, but only stimulated me to more earnest

search for further improvements in the method."

The results within the last two years, due to Dr. Tracy's improved method of preparing the toxins, have been decidedly superior to those obtained before. They now comprise 52 personal successes, and at least twice that number in the hands of other men, which, I think, should be sufficient to convince the majority of the profession that the treatment of inoperable sarcoma by certain bacterial toxins contains a principle of sufficient value to be entitled to more careful consideration than it has yet received, and if I have succeeded in impressing the members of the Royal Society of Medicine with the correctness of this view I shall feel more than repaid for my visit to England.

In closing, I wish to state that the results that I have reported would never have been possible without the help of others, and I desire to again express my deep sense of obligation to Dr. B. H. Buxton, Professor of Experimental Pathology at Cornell University (Medical Department), for early and continued help in the preparation of the toxins. Whatever efficiency they have is largely due to his skill and patient coöperation. I desire also to acknowledge a great debt to the late Dr. William T. Bull, for most generous help and encouragement, especially in the earlier experiments with the living cultures. The large amount of clinical material could not have been obtained without his influence and coöperation.

My thanks are also due to Dr. Martha Tracy and Dr. S. P. Beebé (of the Huntington Cancer Research Fund), for suggesting valuable improvements in the technique of preparing the toxins within the last two years.



## THE CURRENT THEORIES REGARDING ARTERIO-SCLEROSIS.

## III.—THE SYMPTOMS.

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THE symptoms of arterial disease may vary greatly in different patients, as they depend both upon the variety of the arterial lesion and upon its special site; and are, in the majority of cases, the results of defective function of the various viscera rather than an indication of the process which has produced them. The symptoms of an aneurysm, for example, are mainly pressure symptoms, and only to a slight extent due to the dilatation itself.

In my previous papers<sup>1</sup> I considered the origins of arterial disease as a whole. They may be divided into two main groups: (1) the focal or nodular lesions; (2) the diffuse form; the latter being arterio-sclerosis, using the term in its more limited sense; while the former contains atheroma, endarteritis obliterans, and medial calcification. This main division is important, for the two groups contrast in almost every particular.

In the first, the lesions are always local and never of great size, although they may be numerous, and, by coalescence, may affect considerable tracts of the vessels. The larger arteries are chiefly involved. In atheroma the wall is weakened and dilatation of the vessel, or even rupture, may ensue. In endarteritis obliterans, the arterial lumen is narrowed, and thrombosis often follows, a result which is more unusual in atheroma.

In arterio-sclerosis, however, the whole of the arterial tree is involved, and the change is most considerable in the smaller vessels. The walls are thickened and on the whole strengthened, so that dilatation or rupture are uncommon save in the cerebral arteries, where miliary aneurysms, the common cause of cerebral hæmorrhage, are often found. Thrombosis is comparatively rare, but the lumen is often narrowed, and the visceral blood-supply may be limited in consequence.

The focal lesions may be widespread, and even extreme,

<sup>1</sup> THE PRACTITIONER, 1905, Vol. LXXV., p. 203; *ibid.*, 1906, Vol. LXXVI., p. 317.



without causing any abnormal strain upon the left ventricle. In other cases, however, where the thoracic aorta or the splanchnic arteries are involved, the left ventricle may be considerably hypertrophied. In arterio-sclerosis, on the other hand, the left ventricle is always hypertrophied, sometimes to an extraordinary degree; and, as also happens in valvular flaws, the reserve power is necessarily more limited than in health, and the "field of response" is correspondingly diminished. The essential cause of arterio-sclerosis is continued elevation of the arterial pressure, and the arteries as well as the heart are at first thickened by muscular hypertrophy. In time, however, fibrosis supervenes and their elasticity is largely lost.

One must distinguish between two types of arteries. One set are the "mains" for the distribution of the blood, affording an elastic assistance to the heart, and ensuring a continuous flow, at equable pressures, through the capillaries. The other set are the "supply pipes," with "taps" which can be, at any rate, partially shut, and can thus alter the distribution of the blood among the various organs as necessity dictates. If the mains are rigid, the heart has more work to do, and the capillary current is less even in its flow. If the supply pipes are stiff, the "taps" cannot be altered at discretion, and variations in the functional demands of the tissues can only be inadequately supplied, and that by variations in the general blood-pressure and an increased strain upon an already overtaxed ventricle.

The symptoms in the two groups arise in different ways. In the focal cases they are the results of hæmorrhage, thrombosis, or arterial dilatation. The results of hæmorrhage vary mainly with its amount and also, to some extent, with its site, a cerebral hæmorrhage for instance causing death with a loss of blood which, if external, would probably occasion little, if any, discomfort. The results of thrombosis depend both upon its site and upon the rapidity of the closure; a sudden occlusion of a coronary artery may produce a myocardial infarct or a rupture of the ventricular wall, while a gradual narrowing may allow of compensatory dilatations of anastomosing vessels, with but little interference to the nutrition of the cells involved. The results of dilatation of an artery depend mainly upon its size and its site, and are most marked when it obtains within a cavity of fixed dimensions, *e.g.*, within the cranium. The lesions which are thus produced are, as a rule, isolated and single, though

sometimes of considerable size.

In arterio-sclerosis the visceral lesions are general, widespread, multiple, and individually of trifling degree, though their collective influence may be great. Dilatation and hæmorrhage are unusual, save in the case of the cerebral arteries, and thrombosis is also infrequent. But the lumen of the vessels is often narrowed, and the visceral blood-supply is, in consequence, diminished—an effect which is intensified by the limitation of the response to vasomotor influences entailed by the fibrosis of the vessel walls. This fibrosis, too, not infrequently spreads into the tissues from the adventitia, and produces little islets of fibrosis in the organs, entangling and destroying the adjacent cells. Any of the viscera may be involved in this process, but the heart and the kidneys are the common sufferers. Renal changes are the rule in arterio-sclerosis. The initial fault is often renal, a cirrhosis of acute or chronic type; and a somewhat similar condition, the arterio-sclerotic kidney, is always more or less visible in the cases which have arisen from other than renal faults.

The symptoms of the two groups contrast correspondingly. In the focal group, aneurysm, infarct, and hæmorrhage are the essential conditions. In arterio-sclerosis, the heart is always overtaxed, renal excretion is generally inadequate, and the other viscera are apt to be damaged; while their function is still further impaired by the limitation of their blood-supply produced by the arterial disease and the relative cardiac insufficiency. At first symptoms will occur only on special strain, whether physical, mental, or visceral; but ultimately even the normal work will be imperfectly performed. The onset of symptoms is thus insidious, unless some special cause precipitates their advent. In the focal group, the symptoms often ensue in a sudden manner, and are acute from the outset.

From yet another standpoint the two groups contrast. The causes of the first group are numerous: syphilis, tuberculosis, trauma, intoxications and infections of various kinds. And while some of these may be continuous in their action, others have only a limited period of harmful activity. Focal lesions may then be either progressive or merely the healed scars of ancient wars. Arterio-sclerosis, on the other hand, is due to continued high arterial pressure. And although in some cases the initial elevation is probably of functional origin,

and so removable on removal of its cause, in others it is secondary to visceral lesions which are incurable. When once permanent changes have occurred in the vessels the high pressure is permanent. The strain upon the heart and vessels will continue, and as time goes on the lesions will inevitably progress.

The symptoms in arterial disease may thus be produced in various ways, and as they may be related to almost any organ, and may simulate even closely symptoms due to other pathological lesions, their exact significance may be difficult to determine. This is particularly the case with the focal diseases. In arterio-sclerosis, the underlying general condition can in most cases be readily recognised.

The essential and constant feature in arterio-sclerosis, at any rate until cardiac failure is well marked, is elevation of the aortic blood-pressure. In a large group of cases, a renal cirrhosis occurs, if not antecedent to, at least *pari passu* with, the cardio-vascular changes, which are compensatory and permanent. Sometimes the cardio-vascular hypertrophy is not well marked, and death then seems to ensue more early in the case than is the rule when the hypertrophy is considerable. The cause of the failure may lie in anæmia and debility consequent on the renal disease, or other coincident causes, but is sometimes, at any rate, of congenital origin. We cannot all of us become Sandows, even if we follow a similar line of training, and the vascular musculature is in many ways comparable to the muscles of the limbs.

But in another group of cases, as Sir Clifford Allbutt has urged, no renal disease at first co-exists. The primary fault is an intoxication of varied origin which produces an increase of the peripheral resistance and a consequent elevation of the aortic pressure, but an elevation which at first depends upon removable causes, and can thus for a time be dissipated by suitable treatment.

The recent introduction into clinical methods of the Riva-Rocci sphygmomanometer<sup>1</sup> and its numerous modifications has put within the reach of the practitioner a method by which the arterial pressure may be measured with fair accuracy and without any special difficulty of technique. But, while it is useful to have figures which can be contrasted, a measure in some way of the severity of the disturbance, it must be

<sup>1</sup> THE PRACTITIONER, 1904, Vol. LXXIII., p. 218.



remembered that the blood-pressure varies to a considerable extent in the healthy individual from causes of a temporary and often trivial nature (emotion, exercise, diet, etc.) the influence of which cannot always be accurately correlated, and that similar results may be noted even in well-marked examples of high blood-pressure. The earlier readings in hospital patients confined to bed are often evidently inaccurate, on continued observation, from causes of this temporary kind, and but little importance should be attached to isolated observations, though charts are sometimes of considerable value.

The information which is desired can, too, be obtained from other data. Digital examination of the pulse is at the present day too much depreciated ; and while I must acknowledge that my impressions of the arterial pressure from such examinations have not infrequently been at variance with instrumental readings, a constant comparison has led to greater accuracy. The error seems to lie in the failure to appreciate that the size of the pulse-wave and the pulse-pressure have no constant relation to the height of the aortic pressure ; to take a concrete example, the large quick pulse of aortic regurgitation may be of much lower pressure than a small but wiry pulse.

The sphygmomanometer, too, gives no information with regard to the condition of the arterial walls, information which is readily afforded by the finger ; and if all the accessible arteries (radial, brachial, temporal, facial, femoral, dorsalis pedis) are explored, a fairly accurate idea of the condition of the vessels as a whole may be obtained. It is true that the condition of the peripheral and the visceral vessels by no means always corresponds, and changes may be extreme in one set without the other being seriously involved, but, on the whole, the comparison is apt. The failure in correspondence is seen chiefly in the focal lesions ; in arterio-sclerosis the association is more absolute, so that, while irregularities in the vessel-walls convey only a limited significance, a general thickening is always important. The ophthalmoscopic evidence, too, may be unmistakable.

Examination of the heart is, of course, equally essential. A well-sustained apex impulse displaced downwards into the sixth or seventh interspace, prolongation and dulling of the first apical sound, and accentuation of the second aortic sound

are, in the absence of valvular flaws, positive evidence of high aortic pressure. The second aortic sound may be intoned and ringing in quality, but this is more probably due to aortic dilatation, whether local or diffuse.

It is easy to recognise such cases when they come under observation from casual reasons, such as insurance examination, etc., at a time when the compensatory mechanism is well established and sufficient, and symptoms are in abeyance. But an accurate diagnosis may be extremely difficult in the later stages if cardiac failure has supervened. The blood-pressure may be within normal limits, the second aortic sound may not be notably emphatic, and the first apical sound may be short and sharp, or obscured by murmur if the mitral valve has given way before the strain.

Cardiac hypertrophy is not necessarily associated with high arterial pressure. In well compensated cases of mitral regurgitation and aortic stenosis, for example, the degree of ventricular hypertrophy is simply that required to ensure the ejection into the aorta, in the proper time, of the proper amount of blood at the proper pressure. In aortic regurgitation other factors come into operation. If the correct amount of blood is to be left in the arteries at the end of diastole, the amount which is thrown into them during systole must be greater than normal, so as to allow for that which returns into the ventricle as soon as systole has ceased; and the rapid fall of pressure during diastole requires an excessive systolic pressure. The pulse-pressure is the true index of the degree of the mechanical fault. But such a pulse notably differs from that associated with granular kidneys. In aortic regurgitation, as sphygmographic tracings show so well, the pressure falls rapidly, and the mean pressure is low relatively to the maximum. In the renal cases the pressure is well maintained, and the mean pressure is high relatively to the maximum.

A high blood-pressure is not invariably evidence of cardiac sufficiency, and may indeed be accompanied by definite signs of cardiac failure. The most striking example which I have observed occurred in a man aged 51, who was complaining of breathlessness and slight œdema of the feet. The sudden occurrence of a left facial palsy, accompanied by some difficulty in speech, followed a few days later by a partial right hemiplegia, was considered to be the result of cerebral hæmor-

rhage, as the systolic brachial pressure varied from 170 to 210 mms. Hg. But post-mortem examination revealed, in the cortical vessels, multiple emboli which were derived from clots in the dilated left ventricle. And the highest pressure which I have observed, 270 mm. Hg, occurred in a man who became breathless on the least exertion, and developed œdema in the feet and legs whenever he was allowed out of bed.

Such failure is, of course, relative and not absolute. The ventricular wall may be greatly thickened, and the cells may be normal on microscopic examination, but the heart may yet be overtaxed and unable to accomplish its necessary work.

Cardiac strain may arise in two different ways. The heart may be unable to overtake an extra amount of work imposed upon it, or may from intrinsic causes (granular, fatty degeneration, etc.) be unable to accomplish even a normal amount of work. And variations in arterial pressure may thus occur in the direction either of elevation or of depression. In the presence of cardiac symptoms the blood-pressure may be abnormal, while it may be impossible to say whether it is too high or too low for the individual concerned. If improvement occurs, the pressure may rise or fall; as death approaches it may also rise or fall. In chart No. 1 the pressure is seen to fall coincidently with improvement in the general condition, and to rise to higher limits when the final failure ensued. In chart No. 2 the pressure rose with improvement. In chart No. 3 the pressure rose as death approached; in chart No. 4 it fell.

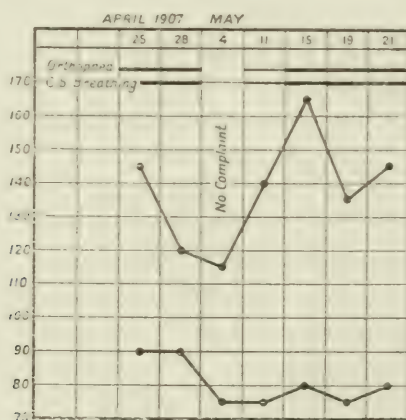
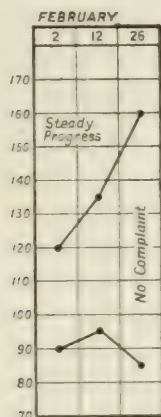
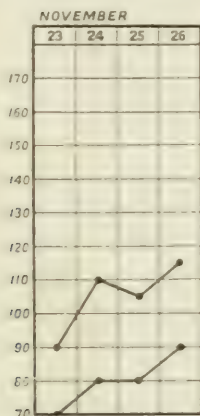
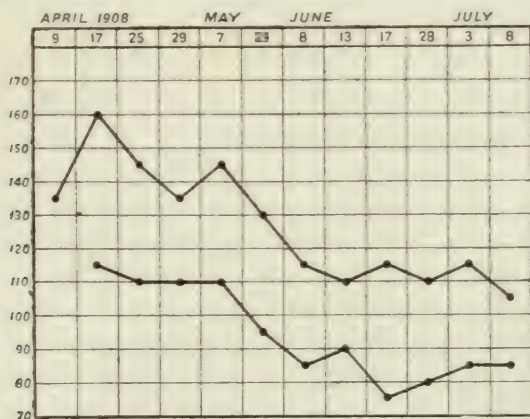


Chart 1.—A. B., *et.* 38. Aortic valvular disease. Attacks of tachycardia occurred on May 10 and 21, and death ensued on May 21.



Chart 2.—R. T., *æt.* 57. Aortic valvular disease.Chart 3.—J. G., *æt.* 40. Pneumonia, alcoholism. Death on November 26.Chart 4.—Mrs. M., *æt.* 35. Mitral disease, etc. Death on July 23.

The blood-pressure may be elevated for a time independently of arterial or renal disease. Chart 5 shows the

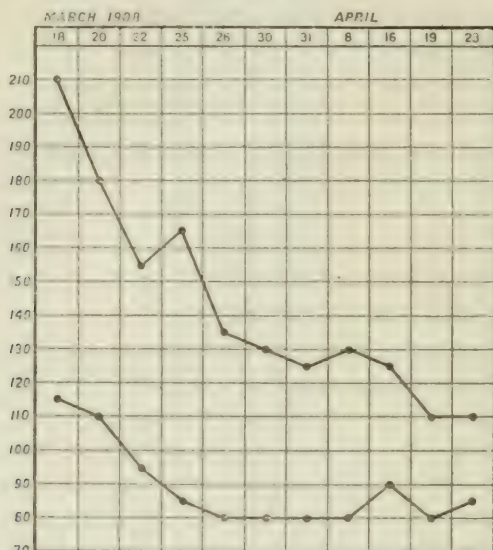


Chart 5.—W. B., *at.* 38.

blood-pressure in a man aged 38, who was an iron moulder by trade. He had always been healthy, save for an attack of pneumonia at the age of 23, and had caught cold a fortnight before admission, though this had not kept him away from work. Ten days later he noticed that his eyelids were swollen in the morning, but the swelling disappeared as the day wore on; his back, he said, was sore when he stooped. He had a headache next day, and his feet were swollen at night. On admission all these symptoms had lessened. There was a trifling albuminuria, and a little œdema in the legs below the knees, but the latter soon disappeared. The urinary output was always ample, and the albuminuria was trifling and sometimes absent. But it was eight days before the pressure fell within normal limits, and three weeks more before the minimum reading was recorded. There was no evidence otherwise of organic disease, and the elevation of blood-pressure was presumably toxic in origin.

High blood-pressure, *per se*, is thus no certain evidence of arterio-sclerosis, as it may be due to temporary causes, and obtains in some forms of valvular disease of the heart. In the

absence of aortic regurgitation, however, its indefinite persistence, despite treatment, and the presence of hypertrophy of the left ventricle, are extremely suggestive of the disease. Widespread focal lesions in the thoracic aorta or the splanchnic arteries are the only other factors which can produce such a condition.

The apex impulse is an uncertain guide in some cases of arterio-sclerosis. It may be hidden by pulmonary emphysema, which not infrequently ensues in arterio-sclerotic cases from causes apparently of trivial character. It may be weak, diffuse, and ill sustained if cardiac failure has supervened, as it is almost invariably in the primary mitral cases when compensation has been broken ; but, on the other hand, it may still be punctate, powerful, and well sustained even when œdema is widespread and general. In the emphysematous cases the cardiac sounds may often be heard best outside the area of dulness, even in the axillary line, and so indicate the enlargement of the ventricle.

The cardiac sounds cannot be relied upon. The second aortic sound may be weakened, with the failure, to such a degree as to be within normal limits, though it is often distinctly emphatic, or it may be wholly obscured by murmur. The special qualities of the first apical sound are often at fault, and it tells merely of mitral reflux or myocardial weakness.

In the absence of these data the condition of the arteries may still be sufficient evidence, and it is here that ophthalmoscopic evidence is so valuable, as the changes are present in the large majority of cases, and persist irrespective of cardiac insufficiency.

The presence or absence of albuminuria is of little value from the diagnostic point of view. Renal disease is of course a common accompaniment of arterio-sclerosis, but it may also occur independently. The small red kidney and the arterio-sclerotic kidney are usually associated with an albuminuria which is trifling in degree, and which may even be wholly absent, at any rate for a time ; and the coincidence of considerable albuminuria indicates the presence of some new factor, perhaps some passive venous congestion, or some accidental intoxication or toxæmia.



The symptoms which are met with in arterio-sclerosis are quite as varied as one would expect from consideration of the pathological lesions. Few of the viscera are absolutely normal, and any one of them may be specially damaged. But the kidneys are almost always more or less involved, and renal excretion is frequently inadequate; and the heart, habitually working close to its maximum power, has a reserve which is but small, and is, in consequence, readily exhausted; so that in practice cardiac and renal symptoms form the bulk of the complaints.

The symptoms which ensue on cardiac failure do not differ appreciably from those that may occur in cardiac insufficiency due to other causes; shortness of breath, palpitation, or other cardiac discomforts, gastro-intestinal disturbances, œdema, etc., are the common complaints. In the earlier stages, when the failure is slight and relative, the diagnosis is easily made on routine examination; but in the later stages, and in the presence of well-defined valvular flaws, one is apt to miss the underlying general condition.

Valvular flaws may arise in various ways. Arterio-sclerosis may hit a heart already damaged by an acute endocarditis, or the converse may obtain. It may cause local lesions in the arteries as well as in the viscera, and the valves may be deformed by a chronic degenerative lesion. The ventricle may give way before the strain, and become dilated, with relative mitral insufficiency. French writers are in the habit of emphasising this difference in origin of mitral reflux by the statement that in one group of mitral cases the lesion begins at the valves and ends at the myocardium, while in the other it begins in the myocardium and ends at the valves.

In uncomplicated cases of mitral disease the sequel of rheumatic endocarditis, the blood-pressure is uniformly normal or below normal. It is commonly asserted that the presence of œdema causes variations in the blood-pressure readings, from the pressure exercised upon the capillary network in the tissues, but my own experience contradicts this conclusion. The presence of œdema in the arms, however, interfering with the proper apposition of the armlet or the correct appreciation of the radial pulse, of necessity introduces factors which are likely to prevent accurate records; but, in its absence,

it is astonishing to find how little variation occurs even in the presence of notable symptoms. In chart No. 6, for

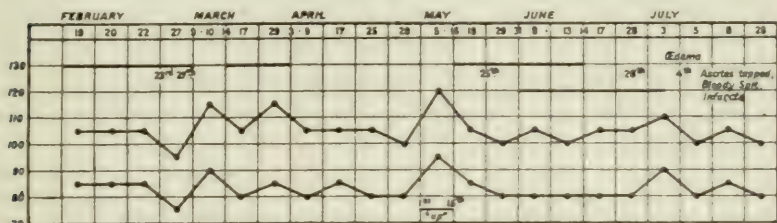


Chart 6.—Mrs. W., *at. 30*. *Mitral disease*.

example, the systolic pressure only varied from 120 to 95 mm. Hg. during the course of observations extending over nearly six months. The patient, who was aged 30, was admitted with orthopnoea, dropsy invading the trunk, ascites, and much catarrh in the chest. For a time all these symptoms were in abeyance, and she was out of bed and walking about the ward without discomfort, but the improvement was only temporary. She spat blood for over a month from the occurrence of pulmonary infarcts, and ultimately left hospital during a recurrence of the symptoms. The highest readings were obtained at a time when compensation was fairly well established.

But other cases occur with symptoms of a similar kind in which the blood-pressure is elevated, sometimes greatly, above the normal. This is shown in chart No. 7, which

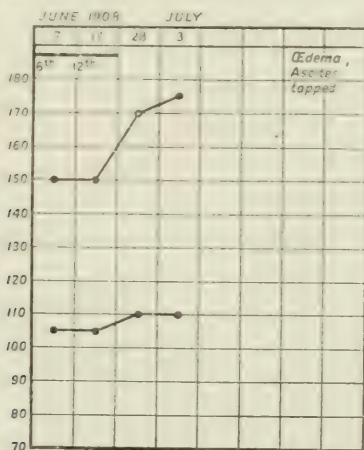


Chart 7.—Mrs. R., *at. 50*. *Mitral regurgitation*. *Recovery*.

shows the pressures in a patient, aged 50, who was admitted to hospital with orthopnœa, dropsy, and ascites, in whom with improvement the pressure rose to even higher levels.

It is extremely important to distinguish between these two groups of cases. In aortic stenosis, and in both the mitral lesions, the blood-pressure is not elevated to any excessive degree, no matter how large the left ventricle may be. The hypertrophy or dilatation is calculated nicely to compensate the valvular flaw, with the object of ensuring the ejection into the aorta of the correct amount of blood, and the maintenance of the aortic blood-pressure at normal levels. An intrinsic cardiac flaw (barring aortic regurgitation, whose effects we have already discussed) is incapable of elevating the aortic pressure, and the presence of a high blood-pressure indicates the presence of some extrinsic influence—an intoxication, renal disease, or arterio-sclerosis. I had hoped to have been able to adduce irrefutable evidence of the truth of these statements from my post-mortem records, but there are still too few to be of much value; but I may state that I have never found an elevated pressure during life to be associated with normal states of the kidneys.

The converse proposition is not, however, equally true. As one would expect, an elevated blood-pressure may fall to, or even below, normal from mere failure of the vis a tergo. The point is exemplified by chart No. 8. The patient, who

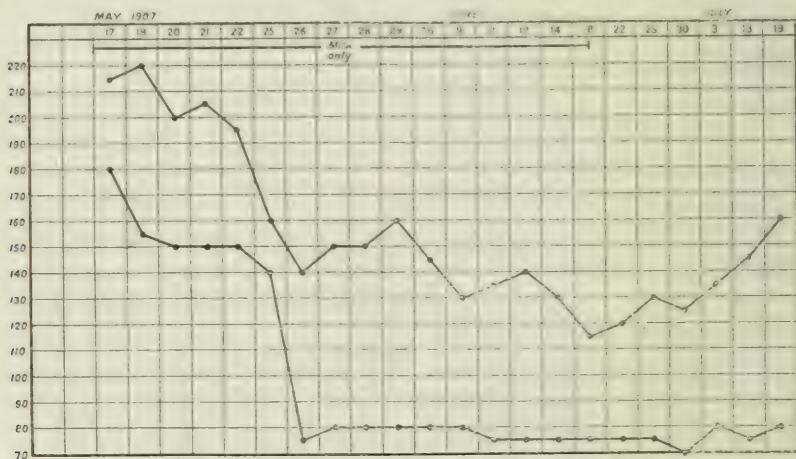


Chart 8.—W. M., *et.* 36. Chronic nephritis.



was suffering from chronic nephritis, was admitted complaining of headache, vomiting, and dimness of vision. The radial arteries were thickened, the left ventricle enlarged, and the ophthalmoscopic picture was indicative of widespread vascular disease, and included several examples of miliary aneurysm. He was kept on a diet of milk alone from May 14 to June 18, in the hope of allaying the renal mischief, and, during this period, the pressure steadily fell, ultimately reaching normal or perhaps subnormal levels. But it rose again on the resumption of a more ample dietary, and on his dismissal was again distinctly high. His symptoms were then in complete abeyance, and he was able to take a fair amount of exercise.

It seems clear that, in this case, the blood-pressure required to be above normal, on account of the renal and arterial disease, and that the normal pressure, on June 18, was due to cardiac weakness from relative starvation. There were no symptoms indicative of cardiac failure, but he was, of course, confined to bed at the time, and they would, I suspect, have appeared if he had been allowed out of bed. He again came under observation in October, with similar symptoms, and a systolic blood-pressure of 225-180 mm. Hg. Treatment was this time of little avail, and he died of uræmia shortly after he left hospital.

In those cases in which arterio-sclerosis and valvular flaws co-exist a correct diagnosis may only be possible from observation of the arteries, the pulse, and the fundus of the eye. The cardiac evidence may wholly fail. The second aortic sound may be weakened from stiffness of the cusps, or inaudible from accompanying murmur, and the first apical sound and the character of the apex impulse may be useless as guides. It should be remembered, however, that in pure mitral disease the second aortic sound is never accentuated, the pulse is never hard or well sustained, and that, with failure, the apex impulse becomes weak, diffuse, and of short duration.

The lesser uræmic manifestations are more likely to escape recognition than the severer symptoms, for the latter are generally associated with well-marked evidences of both cardiac and renal disease; but the diagnosis is generally definite on a careful routine examination. The symptoms not infrequently

succeed some special additional intoxication, often a gastro-intestinal indiscretion, and may remain for long in abeyance if circumstances permit a mode of living on physiological lines.

Shortness of breath is a symptom of which arterio-sclerotic patients frequently complain, and it requires some special attention, as it may arise in several ways.

Emphysema not infrequently occurs in middle-aged people from causes which are apparently trivial in their character. A cough, which is not necessarily of long duration or of great intensity, and may never have seriously inconvenienced the patient, may be the only apparent cause. But it will often be found, in such cases, that the pulse is hard, that the arteries are thick, and that the second aortic sound is accentuated. The lesion has resulted from trivial causes on account of the impairment of nutrition produced by the arterial disease. And it is of course often combined with more or less chronic bronchitis.

In another group of cases the shortness of breath is related to exertion, and evidently is due to relative cardiac insufficiency, even though the pulse is full and hard and the left ventricle is hypertrophied and powerful.

But in a third group of cases it is probably toxic in origin. Cheyne-Stokes respiration, for example, occurs almost exclusively in cases of nephritis and the "senile" type of cardiac disease; and then is present in the class of case in which elimination is likely to be insufficient; but it is conspicuously absent in the chronic cardiac failure which follows acute endocarditis. Cardiac "asthma," too, is less common in the latter group than in the former, while, as is well known, primary asthma is not infrequently dependent on causes of a toxic nature. The slighter manifestations of dyspnœa sometimes own a similar origin, and eliminative treatment should always be pursued whenever the dyspnœa is nocturnal or paroxysmal in character, or of a severity which seems disproportionate to the other evidences of cardiac or pulmonary embarrassment.

It is impossible to enumerate all the symptoms which may emerge in arterio-sclerosis. Many of them are cerebral (giddiness, faintings, etc.), many are peripheral (cramp, intermittent limp, etc.), many are visceral; while even such diseases as gastric ulcer, pancreatic diabetes, and enlargement of the pros-

tate have been considered to be the result of arterial disease. It seems probable, too, that in some instances, the proposition is accurate, though of course these symptoms may be produced by very different pathological conditions.

But my point is served if it is recognised that not infrequently in middle-aged and elderly people there is, underlying any local symptom which may require attention, a widespread general disease, arterio-sclerosis: a disease which is essentially progressive, though its progress may be delayed by suitable treatment; and in which, quite apart from any special local lesion, the arteries are everywhere more or less damaged, the cardiac reserve is always lessened, and the renal functions are more or less impaired.

Arterio-sclerosis is no new disease. It is "plethora"; it is often "renal inadequacy"; it is often "senile heart"; it is often "gout of the aberrant type," and the "uric acid diathesis." In many cases it is "old age," which is but rarely the wearing out of undamaged tissues, and too generally the result of physiological misbehaviour in the past: misbehaviour which leaves its first marks upon the arteries.



## A NOTE ON THE OCULAR MANIFESTATIONS.

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The earliest and most common ophthalmoscopic evidences of arterio-sclerosis in the retina are irregularities in the calibre of the arteries due to local thickenings of the intima, and constriction of the veins where they are crossed by the rigid arteries. The narrowing of the arterial lumen is sometimes more uniform, and may be such that the blood-columns are reduced to mere threads. To the same stage belong two other conditions, namely, undue tortuosity of the arteries, and an excessive brightness of the central light streak, giving to the arteries the so-called "silver-wire" appearance. Globular or fusiform dilatations of the arteries, causing the appearance of miliary aneurysms, may also be found.

The walls of normal retinal vessels are invisible, so that we see only the blood-stream. The more advanced stages of arterio-sclerosis render the vessel-walls visible. The first



evidence of loss of transparency of the wall is that the blood-column looks paler, and the central light streak less striking than the normal. Later on the process of thickening and degeneration in the vessel-walls proceeds so far as to produce the ophthalmoscopic feature described as "perivasculitis," that is, either the blood-stream is bounded on each side by a clear white line, or it is entirely concealed for a greater or smaller part of its course by a dense white band, which represents the opaque wall of the artery. Bright, glistening spots in the walls of the vessels may represent deposits of lime or cholesterine.

The veins may, but do not usually, show such marked changes as the arteries. Constriction of the veins, where crossed by the arteries, has already been mentioned. In the more advanced stages the veins become dilated and tortuous, and may show irregularities of calibre, or beading, similar to those seen in the arteries. Excessive prominence and tortuosity of the finer venous radicles is rather a characteristic appearance.

The optic nerve also alters in appearance. It becomes congested, and we may observe œdema, either confined to the disc and to its immediate neighbourhood, or affecting the whole of the retina.

Retinal hæmorrhages are common, and may be present even when the only visible vessel-changes are irregularities of the arterial calibre and constriction of the veins by the arteries. With or without retinal hæmorrhages, we may see white spots and patches, due to retinal degeneration. These occur even in the absence of renal disease, and it is indeed uncertain whether the characteristic changes of albuminuric retinitis are due to the accompanying vascular changes, or whether both are attributable to the one underlying cause.

Besides the changes described in the retinal vessels, sclerosis of the choroidal vessels may be seen, giving the appearance of a network of white lines which represent the opaque vessel-walls.

Two conditions, which present very striking and characteristic ophthalmoscopic pictures, may be referred to as strong evidence of the existence of local vascular disease. These are obstruction of the central artery of the retina, and obstruction

of the central vein. In the former case, the retina at the posterior pole of the fundus presents a milky-white opacity, in the centre of which the fovea stands out as a bright, cherry-red spot. The disc is pale, the arteries are reduced to threads, and the veins are also somewhat narrow. While these appearances used to be considered characteristic of embolism of the central artery of the retina, it has been proved that in many, if not in most cases, they are brought about by obstruction of the artery, either from endarteritis, or from endarteritis *plus* thrombosis. Obstruction of the central vein of the retina is usually caused by thrombosis associated with local disease of the vessel-wall. Ophthalmoscopically the veins are seen to be dark, distended, and tortuous, the arteries are narrow, the nerve-head is congested and œdematous, and the retina contains abundant hæmorrhages and white exudative patches. This condition is apt to lead to destruction of sight by the development of glaucoma (hæmorrhagic glaucoma).

Other ocular evidences of angio-sclerosis which may be mentioned are the slowly progressive optic atrophy, which sometimes results from pressure of a sclerosed ophthalmic artery; on the optic nerve within the optic foramen; the pupillary disturbances, due to sclerosis of the iris vessels, or those which sometimes accompany disease of the aorta and the visual defects which result from focal brain disease of vascular origin.

The somewhat rare retinal condition, called retinitis circinata, is thought by some to be due to disease of the retinal vessels.

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## NOTES ON RHEUMATIC HEART DISEASE IN CHILDREN.

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RHEUMATISM is probably, next to tuberculosis, the most serious disease of childhood in this country, and in some respects hardly takes the second place. Sufficient justification for this statement is afforded by the fact that of all the children of five years old and upwards admitted, in three different years, to the medical wards of the Victoria Hospital for Children, Chelsea, nearly 50 per cent. were suffering either from rheumatic fever, from chorea, or from heart disease (not congenital), that is to say, from rheumatism or its consequences. Of the boys about 40 per cent., and of the girls nearly 58 per cent., were rheumatic. I need hardly say that I regard chorea as essentially a manifestation of rheumatism attacking the nervous system, and the cardiac lesions with which it is so commonly associated as indistinguishable from those which develop in what is called an ordinary attack of rheumatic fever. Experience of chorea in a children's hospital, and of its constant association with other rheumatic manifestations, either in the same children or in their relations, inevitably forces one to this conclusion.

Tubercle attacks nearly every part and organ of the body, but rheumatism is not far behind in the variety of its manifestations—the heart, the blood, the nervous system, the joints, the pleura, the throat, and the skin being all liable to suffer in greater or less degree. It is, however, the tendency of rheumatism to attack the heart which renders it so particularly grave an affection. Most, if not all, of the other disorders to which it gives rise in early life, however prolonged and however liable to recurrence they may be, are likely eventually to get quite well, but damage to the heart is usually irreparable, and even though the original cardiac lesion may not be actually progressive, yet its secondary consequences tend to become increasingly serious as the child gets older.

Tuberculosis is often quickly fatal in early life, and hence



figures largely as a cause of death in childhood, whereas rheumatic heart disease is immediately fatal in only a small minority of all the cases, and when it causes death later in life the primary rheumatic factor is rarely mentioned, and so its real importance tends to be underrated. If, however, a directly fatal issue is comparatively rare, complete recovery of a heart damaged by rheumatism is perhaps still more uncommon. In nearly every case there must come, sooner or later, and often in what should be the best years of life, a prolonged period of chronic invalidism and all the long drawn-out symptoms of gradual, progressive cardiac failure. We hardly sufficiently realise that, apart from congenital defects, the vast majority of cases of valvular disease met with before 30 years of age, and a very considerable proportion of those seen in later life, are rheumatic in origin. It is true that in many of these patients no history of rheumatism can be obtained, but a very slight experience of the disease as met with in children sufficiently explains this apparent anomaly. The joint inflammation is often so trivial that it must frequently pass unnoticed or soon be forgotten both by the child and the parents. Even medical men may take a long time to emancipate themselves from the old but most fallacious idea, based on the symptoms of the disease as seen in adults, and as formerly always described in books, that rheumatic fever is primarily an affection of the joints, with heart mischief as a possible complication, whereas in children it would, at least from the clinical standpoint, be more correctly described as primarily a disease of the heart, with synovitis as a possible and usually slight complication. For all practical purposes valvular disease on the left side of the heart in a young adult may be taken as *ipso facto* evidence of an old rheumatic lesion, and thus we realise what a terribly serious disease rheumatism in childhood is, comparatively slight though its immediate mortality may be.

It is an all-important, though most unfortunate fact, that when a child is attacked by rheumatism, no matter in what form, it is comparatively exceptional for the heart to escape, whilst the whole brunt of the disease may fall upon that organ, other evidences of rheumatism being either absent or so slight as to pass unnoticed. In other words, the heart is in early life

the most vulnerable part of the body to the rheumatic poison. Moreover, when the joints escape, it by no means follows that the cardiac affection is likely to be slight ; in fact, the reverse is often the case, and the poison seems to spend itself upon the heart. In many of the most severe and intractable examples of rheumatic carditis which I have seen joint affection has been conspicuous by its absence.

Another possible reason why the serious character of rheumatism in childhood is not sufficiently appreciated is, perhaps, because the cardiac lesion often seems at first so insignificant. Undoubtedly, many of these cases never come under medical observation in their early stages. A child suffers from slight malaise and complains of rather indefinite pains in the legs ; the mother perhaps keep him in bed for a few days, the pains subside, he seems quite well again, and is accordingly allowed to run about, and probably to return to school. Several months may elapse before his increasing dyspnœa and persistent pallor induce the parents to consult a doctor, and by that time the heart is permanently and seriously damaged. It may well happen that even a medical man is misled at the onset of such an attack ; he recognises the rheumatic nature of the symptoms, he finds that the heart is affected, he keeps the child in bed and gives suitable drugs. In a few days the patient seems much better, and is kept quiet with ever increasing difficulty, the parents think he is quite well and that the precautions advised by the doctor are altogether unnecessary ; the latter, perhaps, again carefully examines the patient's heart, finds no trace of enlargement, no marked acceleration of rate—in fact, no sign whatever of disease except a very soft systolic murmur at the apex, not conducted out, and a trifling accentuation of the second sound in the pulmonary area. He concludes that, after all, the damage must be slight, and so yields to the importunity of the parents and allows the child to get about. Possibly the heart is indeed but little affected and no serious harm results, but in other cases the mitral curtains have not yet recovered from a severe valvulitis, and the increased strain to which they are prematurely subjected perpetuates a subacute inflammation which may afterwards lead to much secondary contraction with well-marked valvular incompetence, and, later on, to adhesions between the two

flaps of the valve with consequent stenosis.

Moreover, we must never forget that the heart muscle always suffers along with the endocardium, and hence is weakened for a long time after, so that premature exertion and strain, even if they do not increase the damage to the mitral valve, are only too likely to lead to cardiac dilatation. Unfortunately, we have no certain means of recognising this rheumatic myocarditis, and hence tend to underestimate its importance, if not to forget its existence. It is often impossible to decide for some time whether a rheumatic attack has seriously damaged the heart or not; at least six months must usually elapse before a final and definite opinion can be given, so that opportunity may be afforded for the full development of those compensatory changes which are the most reliable indication of the severity of a valvular lesion. It is not even safe after a recent attack of rheumatism to say that the valves have escaped because no murmur is audible, for there may have been a valvulitis too slight at first to give rise to incompetence, but sufficient to start sclerosing changes which lead to contraction, and so to the gradual development of mitral regurgitation with its characteristic murmur. Some time ago I saw a boy who had left hospital two years before, after an attack of rheumatic fever, with an apparently normal heart; he was found to have well-marked mitral incompetence, although in the meantime he had been attending school without interruption, and had not had a single symptom of any rheumatic trouble. It is possible that an insidious endocarditis may have arisen whilst the boy was apparently quite well and going about as usual, but it is much more probable that the trouble really started with the definite rheumatic attack, but was so slight at first that no murmur was produced.

Valvular disease in a child is a much more serious thing than in an adult because it interferes so materially with the nutrition of the growing tissues. Hence it is one of the wasting diseases of childhood, and when at all severe leads to marked stunting of growth, anæmia, and actual wasting; the rapid development at puberty imposes an especial strain on such children. The danger is greatest in cases of mitral obstruction, because the orifice becomes surrounded by a ring or curtain of fibrous tissue, which tends slowly to con-



tract, like newly formed fibrous tissue in any other part of the body. Thus the orifice, instead of enlarging proportionately to the increased quantity of blood which has to pass through it as the body grows, may slowly become smaller, and to this extent, therefore, the lesion is progressive, although as a rule endocarditis due to rheumatism differs from that due to degeneration in tending to remain stationary when once the secondary results of the inflammation are complete.

There is unfortunately yet another way in which rheumatic heart disease may be truly progressive in children, though rarely in adults. In the latter, later attacks of rheumatic fever may be attended by fresh endocarditis, but the danger of further damage to the heart steadily diminishes, and such mischief, when it does occur, is always associated with definite joint trouble, so that we have ample warning of the possibility of its development. In children, on the other hand, when once the heart has been damaged, relapsing, subacute attacks of endo- and pericarditis, and also of myocarditis, are very prone to occur, often in the most insidious fashion and quite independently of any obvious joint inflammation. Consequently they are very liable to be overlooked and are a common cause of irreparable damage to the heart. For instance, repeated attacks of relapsing pericarditis, following upon mitral disease, may lead to a universally adherent pericardium; the additional strain proves too much for a right ventricle already taxed to its utmost capacity and the child finally succumbs. Pericarditis may usually be recognised by the presence of the characteristic friction sound, but a most important practical question is how to diagnose a fresh attack of endocarditis or myocarditis, or most commonly of the two combined, in the presence of old-standing mitral disease. If it is suspected in good time its evil consequences may be minimised by suitable treatment, especially prolonged rest, whereas if the patient is considered to be suffering merely from transient malaise or from slight failure of compensation due to a chronic valvular lesion, adequate rest is not insisted upon and the heart may soon be hopelessly damaged. A correct diagnosis in such a case is often, however, no easy matter. Murmurs are of no assistance, as they may

have been present for years ; whilst cardiac hypertrophy merely indicates an old lesion, which of course in no way excludes the possibility of fresh mischief in addition. The following are the evidences upon which I chiefly rely in forming an opinion in these cases :—

1. *The presence of subcutaneous rheumatic nodules.*—These nearly always indicate the existence of active heart disease, except that they may sometimes persist for a little time after the heart trouble has completely quieted down, although then more rounded than when they first appear. I have rarely, if ever, seen them during a first attack of rheumatic carditis ; they seem to be associated with the recurrent and relapsing cases only.

2. *Any pyrexia, especially in the evening.*—In a rheumatic child any rise of temperature above 99° F., for which no obvious cause can be detected, should excite at least a suspicion of possible fresh heart inflammation. Certainly this is the only safe rule upon which to act.

3. *Joint pains.*—These, however slight and transient, always indicate the need for most careful observation of the heart, as they show that fresh carditis is by no means improbable.

4. *Any sudden development of, or increase in, anæmia.*—This should be regarded as a suspicious symptom, as not uncommonly it is one of the earliest indications of a renewed outburst of heart trouble.

5. *Excessive and persistent rapidity of the pulse.*—This may be an important danger signal, allowance being made of course for the age of the child and for the existence of chronic valvular mischief.

It must not be supposed that all these five indications are often likely to be present at the same time in any one case ; we have usually to be content with two or three. A short time ago a girl, æt. 6, was admitted under my care with signs of double mitral disease, due almost certainly to a first rheumatic attack two years before. She had had slight malaise for a week, but no definite pains. Her temperature for the first ten days in hospital never rose above 99° F. and she did not complain of any pain. After careful consideration I concluded that there was no recent heart trouble, and therefore, although she was kept in bed to rest the heart, she was

not given any anti-rheumatic drugs. The sole disquieting symptom was a persistently rapid pulse, between 110 and 120. At the end of ten days, whilst the child was still being kept entirely in bed, her temperature suddenly rose to  $102^{\circ}$  and she developed a very acute attack of pericarditis. In all probability fresh endocarditis and myocarditis were already present when she was admitted and accounted for the excessive pulse rate; had she been treated from the first with aspirin or salicylate of soda it is at least possible that the subsequent pericarditis might have been averted.

Having realised the great frequency of rheumatic heart affections in childhood, whether endocardial, myocardial, pericardial, or all three combined, the insidious way in which they often develop, and their extreme gravity in many cases, especially for the patient's future well-being, we come naturally to the all-important question of treatment. Obviously, just as in the case of tuberculosis, the first thing at which to aim is prevention, for once the heart has been damaged by rheumatism a complete cure is likely to follow in only a small minority of cases. We need, therefore, to keep a special watch upon children in rheumatic families. The disease is undoubtedly very hereditary, and I am inclined to think that the stronger the family tendency the greater the liability to serious heart trouble. In the graver cases I have certainly found it rather exceptional not to be able to obtain definite evidence of rheumatism in other members of the family. Accordingly the parents of such predisposed children should be strongly urged at once to keep them in bed and under medical observation for the slightest malaise, particularly if any pain in the joints or muscles is complained of. Whenever symptoms in these children are not obviously due to some non-rheumatic cause it is probably wise to give salicylate of soda or aspirin. Treatment on these lines, with absolute rest in bed from the first, must to some extent diminish the liability of the heart to be attacked. I need not enter here upon the familiar details of suitable clothing, residence, etc. for these rheumatic families.

Unfortunately in only too many cases the most careful preventive measures prove inadequate, because the heart is commonly affected at a very early stage, and is often either



the first or even the only part of the body to be attacked by the rheumatic poison. What, then, are we to do when once the familiar systolic murmur at the apex and the accentuation of the second sound in the pulmonary area indicate that the heart is already damaged? It may very rightly be said that these signs, whilst undoubtedly indicative of mitral regurgitation, are not necessarily or even probably produced by inflammation of the valve, for the earliest valvular changes to which rheumatism gives rise are of such a nature that it is scarcely conceivable that by themselves they can cause any incompetence; the tiny vegetations which first appear close to the free margins of the flaps can hardly interfere with their accurate apposition during the ventricular systole. The real cause of the incompetence in most of these early cases must be sought for in the condition of the ventricular muscle. Researches during the last few years have shown that the myocardium suffers quite as much, if not more, from rheumatism than the endocardium and the pericardium. The rheumatic poison may weaken the muscle by its direct toxic action upon the fibres, or it may give rise to a definite myocarditis, which may include the formation of nodules similar to the subcutaneous ones with which we are now so familiar (Carey Coombs, *Quarterly Journal of Medicine*, Vol. 2, No. 5, p. 26).

Almost certainly these myocardial lesions are the cause of the initial mitral regurgitation, because they especially weaken the sphincter muscle surrounding the left auriculo-ventricular orifice, the proper contraction of which is as essential for the complete closure of the opening as is the integrity of the valvular curtains themselves. The contraction of this muscle is doubtless further weakened by the marked anæmia usually present, and so characteristic of these rheumatic cases. The final and most important conclusion, however, at which we arrive, from all the clinical and pathological evidence available, is that when the damage to the myocardium in a rheumatic attack is sufficient to give rise to mitral incompetence in the manner just described the valve itself is in all probability inflamed also, so that the murmur, although not actually due to mitral endocarditis, is none the less nearly always indicative of its presence. Thus the argument for thorough

and effective treatment, at the earliest possible moment, of a child who has just developed a systolic murmur at the apex is rendered all the stronger because we have to deal not merely, as was formerly thought, with endocarditis, but with myocardial disease also.

The first and most essential point upon which to insist in the treatment of such a case is the paramount importance of prolonged and complete rest. The child must not merely be kept in bed, but must remain absolutely recumbent for a period depending upon the severity of the attack, but for not less than several weeks. Six weeks may be regarded as an average time, but in some instances, especially when pericarditis has been present as well as endocarditis, or when the pulse remains persistently rapid, a considerably longer period may be necessary, whereas after a very slight recurrent attack a somewhat shorter time may suffice. During this time the child should be kept on a very light diet, for his bodily needs are reduced to a minimum, and it is most desirable to avoid anything calculated to raise the arterial tension, and so throw additional strain upon the left ventricle. At first, especially while there is any fever, milk will be sufficient; later on, bread, butter, eggs, farinaceous puddings, fruit and vegetables may be added gradually. I usually give fish when the child begins to sit up, and a little meat when he is allowed out of bed. Constipation is often very troublesome and most undesirable, so that laxatives must be given freely as required. In very obstinate cases I find a combination of sulphate of magnesia, cascara, and syrup of senna particularly useful; it may be given once, twice, or even three times a day. A little tincture of nux vomica and tincture of belladonna may sometimes be added with advantage. At the onset, especially if the tongue is much furred, a few doses of calomel are very beneficial.

Great caution must be exercised in allowing the child increased freedom of movement, as very little exertion or excitement will markedly quicken the pulse and may even lead to a sharp rise of temperature. He should be propped up in bed for a week before being allowed on a couch, and, even if his progress is satisfactory, another week should elapse before he is permitted to stand. For several weeks sub-

sequently movement should be much restricted and only allowed on the level, and until at least six months have elapsed since the heart first became affected no active exercise, and particularly no competitive games, should be permitted. Rest, when carried out in this thorough manner, certainly does much to diminish the severity of the cardiac lesion, and to minimise its future consequences. The fact that we cannot rest the heart completely makes a prolonged period of such rest as we can give all the more important.

We come next to the important question of the administration of anti-rheumatic drugs. It must be admitted that the influence of the salicyl groups of drugs upon cardiac rheumatism is most disappointing as compared with their remarkably satisfactory action upon the joint inflammation when given in adequate doses. The synovitis usually clears up entirely in from 24 to 48 hours, but the effect upon the damaged heart, so far as can be inferred from signs and symptoms, is only too often inappreciable. Probably the chief reason for this striking difference is that the inflamed joints are kept quiet, whilst the inflamed heart can, at best, have but very partial rest; moreover, directly endocarditis develops, fibrin is deposited on the damaged valve from the circulating blood, and must subsequently undergo changes which render it impossible for the valve to return to an absolutely normal condition.

Furthermore, in children, as already stated, valvulitis may occur either some days before or even quite independently of any synovitis, with the result that it has often been present for several days before the patient first comes under treatment. The most striking evidence, however, of the comparative inefficacy of anti-rheumatic drugs is that children who have been in bed for some weeks under careful treatment, and who are still taking salicylate of soda, not uncommonly develop a fresh attack of rheumatic carditis. Nevertheless, whilst realising that no great reliance is to be placed upon these drugs in cases of cardiac rheumatism, I consider that it is desirable to give them until something better has been discovered, as they probably tend to diminish, to some extent at least, the severity of the carditis. They are commonly regarded as cardiac depressants, and hence it is argued may



actually do harm rather than good, but I am convinced, at any rate in regard to salicylate of soda, that so long as the drug is pure this view is erroneous. It is the rheumatic poison which depresses the heart and not the anti-rheumatic drug. Dr. Lees maintains very strongly that the reason why we do not get better results with the salicylates is that we give insufficient doses, and he advises that even to children as much as 400 grains of salicylate of soda, and sometimes even more, be given per diem, but I have no personal experience of these heroic doses. Unquestionably if such large quantities are ordered, or even smaller ones over a long period, bicarbonate of soda or citrate of potash should be given also in double the quantity of the salicylate, so as to obviate the risk of the development of symptoms of an acid intoxication similar to those of diabetic coma. I have seen such symptoms arise in a girl of 11 years, who at the time was having only 15 grains of salicylate of soda three times a day. She had been taking it, however, for about four months previously without intermission, and for a large part of the time in more frequent doses, so that the effect had probably been cumulative. Dr. Lees has pointed out that the risk of the development of these toxic symptoms is increased by constipation, a trouble to which, as already mentioned, these rheumatic children, when kept absolutely in bed for many weeks at a time, are particularly prone.

As between salicylate of soda and the recently introduced, closely related, drug, aspirin (acetyl-salicylic acid), I have no special preference. The latter seems rather less likely to upset the stomach, but sometimes slows the heart so markedly as to necessitate a great reduction in the dose of the drug or even its entire discontinuance.

When danger threatens from heart failure strychnine and caffeine are probably the safest drugs to use, with a little brandy in case of emergency. One is naturally inclined to turn to digitalis, but it is not, I believe, of any value in cases of this kind, for when its use appears to be called for the heart muscle is in all probability inflamed, and cardiac weakness due to definite myocarditis is not likely to react satisfactorily to digitalis. In fact, by raising the arterial tension, and so increasing the work of the left ventricle, it may easily do harm

rather than good. During convalescence, I have frequently tried it when the pulse has continued to be unduly frequent, but even then have rarely been able to trace any beneficial result. At this time general tonics are, of course, likely to be useful, but, for some reason which I cannot explain, preparations of iron often seem to disagree and even apparently to increase the tendency to relapse. This is unfortunate, because the anæmia, which is so marked a symptom in these rheumatic children, seems so distinctly to indicate the need for iron. On the whole, I have got the best results during convalescence from simple cod-liver oil; most of the children when taking it improved markedly both in general nutrition and in regard to the anæmia.

For local treatment when there is pericarditis I prefer to follow the advice of Dr. Lees and keep an ice-bag applied continuously over the precordium so long as any friction is audible. Patients usually like it, provided that it is suspended from a cradle, so that as little as possible of the weight falls upon the chest. Pain is not often a prominent symptom in the rheumatic pericarditis of children, and in many cases is entirely absent; when present, the ice-bag is usually sufficient to relieve it. In the comparatively rare instances in which it still persists the application of one or two leeches will generally be followed by its complete disappearance. I think the ice-bag may also be of service in quieting the action of the heart in cases of acute endocarditis, without any pericarditis; but in these patients the local treatment I have used most frequently is that recommended by Dr. Caton, of Liverpool, of repeated small blisters over the precordium, usually eight in all, four on either side of the sternum, one being applied each night. Following Dr. Caton's advice, I have given at the same time for some weeks, 5-grain doses of iodide of potassium or of sodium, every four or six hours, with the hope of aiding the absorption of inflammatory products from the inflamed valves. Unfortunately, I have not had anything like the success from this treatment, combined with the thorough rest already described, that Dr. Caton has experienced. In only a few instances has a murmur disappeared under observation, even when there was every reason to believe that the patient came under treatment at a fairly

early stage of a first attack of rheumatic carditis. Nevertheless, I feel sure that in many such cases, treated on the lines above indicated, although some permanent mischief has undoubtedly been left, yet the damage done has been reduced to a minimum, so that, apart from the ever-present danger of recurrence, the patient may hardly be conscious of any real disability in after life.

I have never found it necessary in a case of rheumatic pericarditis to resort to any operative procedure for the withdrawal of the effusion. Probably in most of the patients the increased area of cardiac dulness is due very largely to the associated dilatation of the heart, and a really big effusion, such an one as would threaten life, is comparatively rare. Some of the most reliable indications of a considerable effusion are to be found over the posterior base of the left lung, where dulness, tubular breathing, and bronchophony may be heard over a large area. These physical signs are doubtless due to pulmonary collapse from pressure, but they may be quite indistinguishable from those produced by an acute pneumonic consolidation. Should it be considered desirable to withdraw a rheumatic pericardial effusion, the safest plan is certainly to make a definite incision and open the sac. To plunge a needle into the pericardium, in the same way that we do into a pleural effusion, is to incur the gravest risk of puncturing the heart, for, in the first place, it is most difficult to be sure that the signs present are absolutely pathognomonic of a large effusion, and, secondly, even if this be present it may happen that the heart is anchored by adhesions to the anterior wall of the sac in such a manner that the introduction of a needle is certain to puncture it. The need for operation must, however, be quite exceptional, for we may say in regard to the different lesions of rheumatic carditis, that acute endocarditis alone never proves fatal, except in the rare instances in which it passes into the malignant form; that pericarditis is rarely responsible for death in the acute stage, however serious its ultimate consequences may sometimes be; and that the most frequent cause of a fatal issue in these cases is the affection of the myocardium.





## ACUTE PERITONITIS.

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NOTHING, probably, is now more certain than that the old idea of the idiopathic origin of acute peritonitis in some cases is impossible and obsolete. Surgeons now universally recognise that inflammation of any part is due to the presence of micro-organisms, that the peritoneum is no exception to this rule, and that normally this cavity is free from their presence. For some time it was thought that under certain circumstances the bacillus coli and other microbes might find their way through the intestinal coats, but such ideas had no substantial ground for their existence and are now probably entirely given up; indeed the peritoneum would appear to possess exceptional powers of resistance.

Trauma, however severe by itself and not associated with the escape of any infective material, appears to be powerless to produce it. A case in the wards at Ancoats Hospital at present is a good illustration. Mrs. F., æt. 39, infected after her last child, had a large tubo-ovarian abscess on the right side; when examined under chloroform the mass appeared so hard as to excite a suspicion of malignancy. It was therefore thought best to abandon the vaginal operation originally intended, and to explore and, if possible, remove the mass by the abdominal route. This was done, but it proved to be extremely difficult. The mass was adherent to bowel and thickened omentum, and most firmly to the uterus and pelvic wall; when at last it was enucleated, it left behind a ragged cavity which was drained into the vagina. On examining the mass removed over which the greatly thickened and inflamed Fallopian tube ran, the lower part, that next the vagina, was found to be composed of firm connective tissue of new formation two inches thick, whilst above, and separated from the peritoneal cavity only by a membrane of the thickness of paper, was a cyst full of pus in the ovary itself. The abdominal

operation was justified since it would have been impossible to reach this from the vagina, but it lasted over an hour; yet no peritonitis followed. Some sero-pus came from the vagina, following the removal of the gauze drain, the abdominal wound suppurated slightly, showing that pyogenic organisms had been present; the uterus at the time of operation had been noted as inflamed, and three days later a clot of blood forming a cast of the endometrium was expelled, but throughout the abdomen remained supple, and recovery was fairly prompt; at no time was there any sign of acute peritonitis.

This affection then would appear to occur only after direct infection, and then not so readily as in connective tissue; the organisms must be fairly virulent, and the site of their entry can usually be determined before operation. In incised and punctured wounds, of course, the mode of entry is evident; but in those cases in which the point of entrance is concealed, as in appendicitis or perforated gastric ulcer, for instance, the site can also generally be determined. The symptom complex is well known, but two members of the group appear to have far more significance than the rest—one especially in this question of location—and both are worthy of closer examination; they are first, the facial appearance, and second, the presence of rigidity.

The face is that of a "hunted" person. It is usually said to express "anxiety," but it is far more than that. There is the same piteous appeal for help and the same expression of hopelessness as to obtaining it as is seen in an animal at bay after a long hunt. The sufferer scans the faces of those around, but appears to find nothing there to which he can cling for safety. He feels in imminent danger and knows not how to evade it. You may see such a face also in a child who has just wakened from a nightmare. Once seen it can never be mistaken, and its absence in what might otherwise be taken for such a case is sufficient almost in itself to disprove the diagnosis; in saying this one assumes the absence of morphia, which dissipates it. A few days ago we had a proof of the above. A boy of 14 was brought in with almost a typical history of appendical perforation. He was said to have been unwell for a few weeks. Suddenly, during the day, there had been intense abdominal pain followed by collapse,

which, however, did not last long; the pain was at first general, then it was more or less localised in the right iliac fossa. Their attention being thus attracted to the boy's abdomen, his parents discovered great swelling there which, they said, had not been present before. They called in a doctor, who reported absence of liver dulness; and advised immediate removal to hospital for operation. On admission the abdomen was much distended evidently with free fluid; the liver dulness was present, but much higher than usual, which no doubt accounted for the opinion previously expressed; there was some tenderness but no rigidity of the abdominal walls. The bowels had not been moved since the onset of pain, and the patient had vomited once. The temperature was  $97.6^{\circ}$  F. and the pulse 140.

With all this, the face remained placid; no anxiety, no "hunted" expression was seen. That, and the fact that the abdominal walls were everywhere supple, should have satisfied us that no perforation had taken place, and that no acute peritonitis was present, but the history was so clear and suggestive that an immediate exploration was decided upon. This was done and the case was proved to be one of tubercular chronic peritonitis. The history had evidently been one of those which relatives, suddenly alarmed, are only too ready to give and should have been therefore discounted. However, no harm was done; the fluid, almost pure serum, was emptied, and the abdomen was washed out with normal saline solution. The boy is recovering well.

And the second symptom, to which I have already referred in speaking of this case, is rigidity. In all acute peritonitis this is present, and necessarily present. Its occurrence is automatic. Years ago Hilton showed that if the lining membrane of any joint is inflamed the afferent nerves from it conveyed an impulse to the spinal segment involved, which was immediately reflected to the muscles acting upon that joint, which were consequently thrown into a state of tonic contraction, thereby affording the necessary immobility of that joint, which is Nature's first step towards its recovery. It is evident that in the peritoneum we have the exact analogue of the serous lining of an articulation. The common idea of a joint connotes also the presence of bones and cartilages



but these are by no means necessary adjuncts. A joint is essentially a breach of surface between two tissues which are capable of movement the one over the other, supplied with muscles to effect such movement, a serous membrane between supplying sufficient fluid to render the movement easy, and a nervous arc connecting all the parts concerned. Such an arrangement is present in the abdomen. The "socket" of the joint is the abdominal wall, the "head" of the bone is equivalent to the intestine within, the serous membrane to the peritoneum, and the nervous arc is made up of the sympathetic system supplying the afferent nerves, connected, as Quain has shown, by filaments connecting the ganglia of these nerves to the spinal or efferent nerves.

In an ordinary joint we recognise the action of the nerve arc by the immobility of the levers thus controlled, but that immobility is due to the contraction of the muscles around. In the abdominal "joint," we recognise it by the contraction of the muscles themselves; but in all essentials it is one and the same thing.

In all cases it is the first effect of the inflammatory irritation present; it is automatic, but it is transient. As soon as the tissues are poisoned by the toxins produced, it ceases. In an ordinary joint this takes some time, but in the abdomen, partly because the toxins produced are apparently more virulent, partly, no doubt, because they are more readily absorbed, the result is more speedy and the rigidity consequently more quickly passes away, but during the important period during which surgical intervention can be of use it is present and invaluable.

The *position* of this rigidity is also important, for it yields most valuable information as to the site of the invisible lesion within. When the appendix is involved the lower right rectus and its associated muscles, the lower portions of the right obliques and transversalis are rendered rigid; when the duodenum the upper part of the right rectus, when the stomach usually the upper part of the left rectus. This rigidity is unmistakable, it cannot be overcome by gentle pressure, it is not due to timidity or tenderness. If the hand is kept softly applied and the patient's attention is distracted, it still remains, and it may be the only symptom upon which reliance can

be placed in the event of a doubtful diagnosis; as in the case of a young girl who walked into the accident room some six months ago. She gave a history of having been attacked whilst at work four hours earlier by a sudden severe pain in the epigastrium which brought her to the floor. After a time this passed off and but for a feeling of weakness she would have resumed her work. She was sent down to the hospital by her employer in order to obtain medicine and she had walked in consequence some hundred yards. There was no history of a previous attack and she herself was disposed to attribute her sudden illness to some food taken at breakfast, but our careful house physician examined the abdomen and detected rigidity of the right upper rectus. The occurrence was too recent for the appearance of the "hunted" look, which does not become noticeable until the reaction of the serous membrane has set in. He waited a while, but the rigidity persisted, and acting upon the indication afforded by that symptom alone, coupled with the history, admitted her into the wards. I opened the abdomen in the supra-umbilical median line within an hour of her admission, although at that time she declared herself free from pain, but was still rigid in that area alone, the rest of the abdomen being supple, and found a small duodenal opening from which fluid escaped. The visceral and parietal peritoneum for some distance around was greasy, but otherwise not yet changed. The opening was closed by a purse-string silk suture and the patient made an excellent recovery. A fortnight later posterior gastro-jejunostomy was done and she is now in good health. Here effective interference averted the otherwise inevitable peritonitis which must have ensued, and the possibility of this was due entirely to the recognition of the local rigidity and the due appreciation of its importance. One can hardly lay too much stress upon the necessity for careful search for this sign in any suspicious case of abdominal trouble.

For, as will have been seen, none of the others are so trustworthy or give such immediate warning. Pain, though attracting the attention of the patient and those around in a much more intensive manner, is not nearly so serious. It may be entirely transient, it may be exaggerated by the

sensitiveness or the fears of the patient, or by the desire of those around to create a sensation ; it may be due to many causes, some entirely unconnected with the abdomen. Rigidity is only produced by acute inflammation of the serous membrane, and as far as experience has shown acute inflammation of that membrane is only produced by some lesion demanding instant surgical interference. Its usefulness therefore to the surgeon cannot be over-estimated.

But it must be real rigidity, not the mere contraction due to apprehension. If the examiner suddenly places a cold hand upon the abdomen or attempts by sudden forcible pressure with the tips of his fingers to ascertain the condition of the deeper-seated structures, he will find rigidity whenever he looks for it. The examining hand must be warm ; it must, at any rate at first, be placed flatly upon the abdominal surface and moved gently from place to place : all movements must be gentle, and the patient's attention must be distracted from what the examiner is doing by questions. Then, if persistent resistance in any area is found, the surgeon will be justified in diagnosing rigidity and in acting upon the information so obtained.

And this resistance must be in the abdominal wall itself, not beneath it. In tubercular peritonitis, for instance, it is not uncommon for firm masses of consolidated omentum to be felt, which might be mistaken by a superficial examiner. The same thing might occur in intussusception ; a little care and practice however, would show that these masses are limited by a distinct outline not corresponding in any way with that of the muscles, whilst the abdominal wall itself could be moved to and fro over them.

The more importance is attached to this sign, the more, I believe, will be the cases early rescued from a condition of imminent danger, whilst, on the other hand, if it can be proved to be absent, the surgeon is freed from the anxiety which must always attend a doubtful condition in which there is a possibility that prompt action may make all the difference between life and death.





THE INDICATIONS FOR OPERATION IN  
TUBERCULOSIS OF THE KIDNEY.

## A REVIEW OF RECENT LITERATURE.

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THE question of operation for tuberculosis of the kidney has recently been discussed in a number of articles by different surgeons. At the International Congress of Urology in 1908 it was one of the subjects selected for consideration. I shall briefly review the opinions that have been expressed.

In addition to the actual indications for operative treatment, but bearing directly upon them, several points have been raised. These may be discussed under the following headings:—

1. Is there a primary tuberculosis of the kidney in the strictest sense?
2. By what path does the tubercle bacillus reach the kidney?
3. Is it possible for tuberculosis of the kidney to recover spontaneously?
4. Where one kidney is diagnosed as tubercular may the other kidney not be the seat of latent tuberculosis?
5. Is the advance of the tuberculous disease in one kidney accompanied by a proportional increase in the probability that the other kidney will become affected, and does the removal of the diseased kidney diminish this probability?
6. What are the operations applicable to tuberculosis of the kidney, and what are the indications for each?

I. IS THERE A PRIMARY TUBERCULOSIS OF THE KIDNEY  
IN THE STRICTEST SENSE?

Apart from the possibility of an intra-uterine infection or a direct infection produced by an infected instrument, the situation of the kidney precludes the possibility of primary tuberculosis in the strictest sense. An ascending infection of the kidney along the ureter is impossible without previous lesions of the bladder and ureter. There remain the vascular

and lymphatic symptoms which are closed and into which it is impossible for a tubercle bacillus to enter without previously forming a tuberculous deposit. To enter the blood circulation it is necessary that a tuberculous nodule must rupture into some blood vessel, and although the bacilli may enter the lymphatic channels without forming a lesion of the skin or mucous membrane, they will not be able to grow in the kidney without having first produced a specific lesion of the lymphatic glands at the point of entrance.

Brongersma does not hesitate to say that a primary infection in the strictest sense does not exist. Certain authors have held the opposite view, but a careful examination of their communications shows that the post-mortem examination in these cases was superficial and inexact.

Primary renal tuberculosis has been used in the more restricted sense that the kidney is the first of the urinary organs to be attacked. The term secondary renal tuberculosis is then applied to ascending infection from the bladder.

## 2. BY WHAT PATH DOES THE TUBERCLE BACILLUS REACH THE KIDNEY ?

The following routes are possible :—

- i. Ascending by the ureter.
- ii. Vascular.
- iii. Lymphatic.

i. *Ascending Infection*.—Guyon held that the majority of cases were of this nature, but recently the question has been raised if it actually exists.

Guyon referred to the slight symptoms of renal disease and the pronounced bladder symptoms as evidence in support of his view. It is difficult to find post-mortem cases that support the ascending theory. In all the cases published the tuberculosis is so advanced that it is impossible to say whether it started in the kidneys or bladder.

Brongersma quotes one case recorded by Albarran and Cottet which the advocates of the ascending theory regard as conclusive evidence. In this case there were three ureters, two from one kidney and one from the other. There was tuberculosis of the bladder which affected the area in which

the side of the double ureter opened. The whole of one kidney drained by the solitary ureter and the part of the other kidney drained by the ureter opening upon the tuberculous bladder area were tuberculous, while the part of the kidney drained by the second ureter which opened upon a healthy area of the bladder was free from tuberculosis.

Albarran was the first to state that he had produced ascending tuberculosis in a rabbit. A pure culture of Koch's bacillus was injected into the ureter after ligature of this duct. The animal died four months later greatly emaciated. The post-mortem examination discovered considerable dilation of the pelvis and calyces which were filled with caseous material. The kidney showed streaks of tuberculous material and, microscopically, large numbers of tubercle bacilli in the canaliculi.

Hausen and Kappes have produced tuberculous nephritis in a similar manner. Wildbolz produced ascending tuberculosis in the following two experiments:—

(1) He injected an emulsion of Koch's bacilli into the ureter with a blunt cannula passed through the wall of the bladder.

(2) He injected a similar emulsion into the bladder with a catheter and filled the bladder under a pressure of 2 centimetres of mercury, and ligatured the urethra. Fifteen minutes later he removed the sound and ligature. He draws the following conclusions from his experiments:—

(i) The injection of tubercle bacilli into the ureter can produce a unilateral renal tuberculosis even where there is no obstruction to the urinary flow.

(ii) The renal infection appears to develop by the tubercle bacilli ascending directly to the kidney.

(iii) If the ureteral wall be inoculated at its lower or middle third an ascending renal tuberculosis will follow only after rupture of the tuberculous focus into the lumen of the ureter.

(iv) The injection of tubercle bacilli into the bladder of rabbits will produce a bilateral ascending renal tuberculosis.

(v) If one ureter be ligatured beforehand only the kidney with the open ureter will develop tuberculosis.

(vi) Experiments on animals point to the conclusion that



an ascending renal tuberculosis can develop in the human subject also apart from obstruction to the urinary flow.

Brongersma is unable to agree with the deductions drawn from these cases and experiments. The vesical symptoms referred to by Guyon, he says, may be independent of any lesion of the bladder and may disappear at once after nephrectomy. In regard to the case of Albarran and Cottet, the tubercle had time to spread one centimetre along the bladder to the unaffected ureter during the time it would spread up the two remaining ureters, but it had not done so.

Brongersma quotes the case of a woman who had suffered from tuberculous cystitis for 12 years. Six years after the onset a surgeon recommended removal of the right kidney, as the tuberculosis of the bladder was most extensive in the neighbourhood of the right ureteric orifice. The right kidney was explored and found free from tubercle. Six years later Brongersma found the tuberculous process most pronounced in the neighbourhood of the left ureteric orifice; the left kidney was explored and found healthy. He therefore argues that the tuberculous disease showed no tendency to ascend after a period of twelve years. This surgeon concludes that ascending tuberculosis of the urinary tract does not exist.

Baumgarten after many experiments was unable to produce an ascending tuberculosis of the kidney even when the animals lived for a long time with tuberculous disease of the prostate and bladder base. Nor was he able to induce tuberculosis of the epididymus from an infection of the prostate. He concluded that tubercle bacilli, unlike other pathological bacteria, such as the gonococcus and pyogenic bacteria, cannot spread against a lymph, blood, or secretion stream. This he attributed to their immobility and to their inability to multiply in the secretion. An ascending infection from the bladder to the kidney is therefore impossible according to Baumgarten, since not only the urinary stream, but also, he believes, the lymph flow downwards would hinder the spread of the tubercle bacilli.

ii. *The Circulatory Path of Infection.*—In examining a case of acute miliary tuberculosis Durand-Fardel found tubercle bacilli in the blood vessels of the glomeruli. Miliary tuber-

culosis has been produced in animals by introducing tubercle bacilli directly into the circulation:—

The bacilli arrive at the kidney by the renal artery, and are arrested in the capillaries of the glomeruli and of the cortical substance. They cause a bilateral miliary tuberculosis of the kidneys. How is the unilateral distribution of the caseous form of tuberculosis explained? Those who believe that the infection is through the blood hold that the unilateral distribution is due to the diseased kidney being in a state of inferior resistance compared with its fellow at the time of the infection. Any one of five conditions, they say, is capable of explaining this inferiority.

- (1) Hereditary predisposition.
- (2) Trauma.
- (3) Movable kidney.
- (4) Concomitant disease such as calculus.
- (5) Congenital deformity.

A general predisposition to tuberculosis is accepted, but a local predisposition of one organ has never been demonstrated.

Great importance has long been attached to traumatism as a cause of local tuberculosis, especially in articular tuberculosis. The researches of Friedrich and Housell appear to show that there is no connection between trauma and tubercle. In 403 cases of renal tuberculosis collected from the literature by Küster a connection with traumatism could only be traced in seven cases. In 72 cases Brongersma has only found one case where a more or less direct connection could be traced between injury to the kidney and tuberculous disease. Such cases are therefore exceptional.

Küster gives movable kidney an important place in the causation of renal tuberculosis. In support of his view he shows that both diseases are much more frequent in women than in men, and the right kidney is more often affected than the left. The proportion of renal tuberculosis in men and women is 1 : 2. The argument is however weakened by the fact that the proportion of movable kidney differs greatly from that of tuberculosis and is 1 : 10.

In regard to the side affected Küster found in 368 cases 189 right and 163 left kidneys, or about 11 to 10, a different proportion to that of movable kidney. There were only 5 per

cent. of cases in Küster's collection (18 in 403) in which tuberculosis and mobility were combined. Other maladies such as stone and malignant disease have been noted as complications, but they are rare. And further, the combination of tuberculosis with congenital deformities is so rare as to be unimportant.

Brongersma does not consider that the theory of infection by the blood vessels in caseous nephritis is compatible with the fact that it is constantly unilateral at the outset.

iii. *The Lymphatic Path of Infection.*—Tendeloo has shown the important rôle played by the lymphatic system in renal tuberculosis.

He recorded two cases where renal tuberculosis appeared to be secondary to pulmonary tuberculosis through the medium of the lymphatics.

In 71 cases of renal tuberculosis where there were symptoms of pulmonary or pleural tuberculosis it was found that these lesions were on the same side in 62 cases. The unilateral distribution of renal tuberculosis, according to the author, is explained by lymphogenous infection.

The facts that renal tuberculosis is more frequent in the female subject, and that the right kidney is more frequently affected, are explained as follows:—

(1) Tuberculosis of the bronchial and mediastinal glands, the most common cause of tuberculous pleurisy, is much more frequent in the female than in the male subject.

(2) The right lung with the local lymph glands are much more frequently tuberculous than the left. Renal tuberculosis is much more frequently bilateral in children than in adults. Brongersma considers that this further supports the lymphatic theory since the lymphatics in children are very large and favour the dissemination of the bacillus. This author thinks that although there are several gaps in our knowledge of the subject, the lymphogenous theory is much more acceptable than the ascending and hæmatogenous theories.

### 3. IS IT POSSIBLE FOR TUBERCULOSIS OF THE KIDNEY TO RECOVER SPONTANEOUSLY?

In making a necropsy on an individual who has died of tuberculosis small fibrous or cretaceous areas are sometimes



found which are regarded as signs of a process of healing of renal tuberculosis. This view may be correct, but it is impossible to furnish decisive proof. The clinician has no means of diagnosing closed foci of renal tubercle. It is necessary that a tuberculous cavity should have perforated into the pelvis or that the pelvis should be secondarily infected by it, so that an open tuberculous process is present. The question whether an open renal tuberculosis may heal spontaneously is important therapeutically. Most surgeons with an extensive experience in this field deny the possibility of spontaneous healing, but some hold the opinion that it is possible. In some at least of the cases which are quoted in support of the latter view the kidney was completely destroyed when the process became quiescent. Brongersma pertinently remarks that if we are to regard the total destruction of an organ both anatomically and physiologically as a proof of spontaneous healing, we may as well regard the death of an individual as a proof of spontaneous recovery from any disease. This author has never met with a case of spontaneous recovery from renal tuberculosis.

Delbet found only one case in 230 where recovery had taken place by fibrous transformation of the tuberculous foci. In other cases, those of Macaigne and Vauverts, the kidney was transformed into a mass of fibrous tissue, but even in this giant cells remained.

Cases are described by these authors and by Roussin, Raffin, and Estor, where after nephrotomy a fistula remained and the tuberculous foci were destroyed by the formation of fibrous tissue which at the same time destroyed the kidney.

Another form of so-called recovery from tuberculosis may take place by the transformation of the kidney into a cyst with caseous contents by obliteration of the ureter.

In 103 post-mortem specimens Hallé found 16 cases of total obliteration of the ureter and in 10 this process was developing but had not become complete. In these cases the function of the kidney was abolished and the dangers of a tuberculous focus remained. Le Fur has referred to cases which he looked upon as cured for 7, 4, 3 years and 1 year respectively. His statements were based entirely upon clinical

data, and he admitted that the urine still contained pus and tubercle bacilli or a large hard nodular kidney remained. Heresco concludes that the spontaneous recovery of renal tuberculosis, if it exists, is exceptional and cannot be counted upon in practice.

4. WHERE ONE KIDNEY IS DIAGNOSED AS TUBERCULAR, MAY THE OTHER KIDNEY NOT BE THE SEAT OF LATENT TUBERCULOSIS ?

Statistics of operations given by various authors when the mortality from insufficiency of the second kidney after nephrectomy for renal tuberculosis show that grave errors are not committed from this cause.

(In the opinion of the collator the operative statistics of the surgeons who use modern methods of investigation in cases of renal tuberculosis before recommending operation cannot be used in answering this question. They only show that the proper cases have been selected for operation and that cases of renal tuberculosis where the second kidney has already been quietly destroyed by the disease have, by the thorough means of investigation, been excluded from an operation which would certainly have proved fatal.)

Brongersma goes on to say that although these statistics show that it is rare to find grave lesions in the second kidney where nephrectomy has been performed, they tell us nothing in regard to latent lesions which develop gradually and only give rise to symptoms after a certain time. It is difficult to say how much time one ought to allow after the operation in order to decide if a tuberculosis of the second kidney was already present at the time of the nephrectomy or if it is due to a fresh infection.

In 233 operations by various surgeons there was only one death from tuberculous disease of the second kidney in the first two years after operation.

Albarran estimates the bilateral frequency of renal tuberculosis at 20 per cent., and Brongersma at 14 per cent. In infancy it is much greater. In Brongersma's cases it was 7 in 12 (53·3 per cent.).

In the post-mortem statistics the bilateral distribution is much more marked. In 345 necropsies 191 were bilateral

and 154 unilateral. There is no doubt that the tuberculous process starts on one side and reaches the other later, for there is always a marked difference in degree between the lesions on the two sides.

5. IS THE ADVANCE OF THE TUBERCULOUS DISEASE IN ONE KIDNEY ACCOMPANIED BY A PROPORTIONAL INCREASE IN THE PROBABILITY THAT THE OTHER KIDNEY WILL BECOME AFFECTED, AND DOES THE REMOVAL OF THE DISEASED KIDNEY DIMINISH THIS PROBABILITY ?

It cannot be denied that the original focus which caused the tuberculosis in one kidney may affect the second kidney in the same way. This probably does occur in many cases simultaneously or after an interval. If this were the rule and there were no connection of cause and effect between the tuberculosis of the two kidneys, the probability of a kidney becoming tuberculous would be the same whether its neighbour were tuberculous or healthy. That is to say, one would find among all the cases of renal tuberculosis the same proportion of cases of bilateral renal tuberculosis that one would meet in the case of renal tuberculosis in all cases of phthisis.

But it is universally admitted that the proportion of bilateral lesions among cases of renal tuberculosis is much greater than that of renal tuberculosis in phthisis generally speaking. It therefore follows that one should find a pretty close connection between the consecutive tuberculosis of the two kidneys. This is further confirmed by the operative statistics of cases operated upon. The proportion of cases where the second kidney, healthy up to the time of operation, becomes tuberculous after the removal of its diseased neighbour is apparently less than the proportion of cases of bilateral renal tuberculosis among the non-operated cases.

6. WHAT ARE THE OPERATIONS APPLICABLE TO TUBERCULOSIS OF THE KIDNEY, AND WHAT ARE THE INDICATIONS FOR EACH ?

1. *Partial Resection of the Kidney.*—This operation has found few advocates up to the present time. The results of some



cases published by Israel, Cramer, Watson, Morris, and Goden have not been sufficiently convincing to encourage a more extended application of the method.

The reason for this is the impossibility of judging with the naked eye whether all the tuberculous areas have been removed. Conforming with what he takes to be the opinion of most surgeons, Brongersma holds that partial resection of the kidney cannot be considered as a suitable treatment of renal tuberculosis.

*Nephrotomy.*—This is of necessity a palliative operation, and can only be considered when the state of the patient demands interference and a more radical method of treatment is contra-indicated. It becomes necessary when:—

- (1) There is profuse or prolonged hæmaturia ;
- (2) There is serious toxæmia by the retention of infective material in the kidney ;
- (3) There is intolerable pain not amenable to medical treatment :

on the condition in these three types of case that the second kidney is congenitally absent or has been destroyed by previous disease, or that tuberculosis or some other disease has invaded it.

In addition to these indications, which are comparatively rare, some surgeons find nephrotomy indicated as a preliminary operation:—

(a) In order to relieve cachexia, especially if it is due to extraneous causes.

(b) To relieve local lesions which make a primary nephrectomy dangerous.

(c) When immediate operation is necessary, and one does not know the state of the second kidney.

The dangers of the operation are not less than those of primary nephrectomy. Pousson's statistics showed a mortality of 27·5 per cent. for nephrotomy, much higher than those of primary nephrectomy, which were 6·54 per cent.

Nephrotomy is done with the idea of following it with a secondary nephrectomy later on. The dangers of this secondary operation are again greater than those of primary nephrectomy. The improvement in the general state of the patient may diminish this disadvantage to a varying degree.

But after nephrotomy suppurating cavities may remain unopened, and these may counteract the expected benefit from the operation.

Pasteau insisted on the advantage of nephrotomy where local lesions render a primary nephrectomy dangerous, as where the surgeon finds during the course of a nephrectomy that the decortication of the sac is very difficult and that the pyonephrosis is of large size with a thin wall.

According to Brongersma the volume alone of the kidney should not prevent its being removed unopened, and this is more easily done by a sub-capsular operation. If tearing of the wall does occur the resulting danger is compensated for by the great advantage of only having to submit to one operation.

Where immediate operation is necessary and we do not know the state of the opposite kidney, Brongersma believes that nephrotomy is still less indicated than in the cases already considered. In these extremely rare cases it is preferable, after having exposed the diseased kidney, to place forceps upon the ureter and give an intramuscular injection of indigo-carmin and collect the urine from the other kidney by means of a catheter in the bladder.

In 58 cases of renal tuberculosis on which he has operated Brongersma has never had recourse to nephrotomy.

Guisy holds, on the other hand, that when the functional value of the second kidney is doubtful one should prefer exploratory nephrotomy by opening and stripping the fibrous capsule of the diseased kidney. This operation is further indicated when the introduction of the cystoscope is impossible or where the cellulo-fatty capsule of the diseased kidney is thick, indurated, and has strong and extensive adhesions to the neighbouring organs and especially with the peritoneum.

*Nephrectomy.*—It is universally agreed that nephrectomy is the only operation capable of removing all the areas of tuberculosis in the kidney. According to some authorities the indications for nephrectomy are severe hæmaturia, unbearable pain, or where the general condition of the patient is so seriously affected as to cause danger to life.

According to other authorities nephrectomy is indicated

the moment that the diagnosis of renal tuberculosis is made.

Guisy holds that in unilateral tuberculosis, diagnosed and confirmed by all the means of exploration of the kidneys, the only treatment by which one can combat this fatal malady is total lumbar nephrectomy performed as early as possible, and after making certain of the functional value of the opposite kidney. In order to intervene sufficiently early one should operate whenever the vesico-renal reflex phenomena appear. But preliminary exploration and comparative analysis of the urine of each kidney by catheterization of the ureters or by endovesical separation of the urine should always be done.

The advocates of late nephrectomy rely upon the following considerations :—

(1) The supposed curability of renal tuberculosis.

(2) The chronicity of the disease which during years is compatible with comparatively good health, so that if nephrectomy is eventually carried out nothing will have been lost.

(3) It may be believed that the supposed healthy kidney is really the seat of latent tuberculosis.

(4) There is a strong probability that the primary focus (which is outside the kidney) will continue after nephrectomy to distribute tubercle bacilli, so that fresh deposits of tubercle will appear in other organs.

The first and third points have already been discussed. In regard to the second, renal tuberculosis may progress so insidiously that the patient does not feel the effects or show any symptoms. There may also be an improvement in the symptoms of varying duration, which sometimes has the clinical appearance of a perfect recovery. If the anatomical lesions of the kidney were to comport themselves in the same manner there would perhaps be reason to abstain from early interference. This is not, however, the case. These lesions progress continuously, and the extent of the lesion is always much greater than the symptoms would indicate.

The progressive tuberculous process in the kidney represents a continual danger to the patient in several ways,—



(a) The diseased kidney may give rise to infection of its neighbour ;

(b) It may be the origin of a general miliary tuberculosis ;

(c) It is a constant menace to the ureter, bladder, and genital organs ;

(d) Like all tuberculous infections renal tuberculosis may cause, by means of tuberculous toxins, a nephritis of the other kidney ;

(e) A tuberculous kidney is readily infected with other bacteria, and in most cases a pyonephrosis develops.

When one realises these dangers which constantly threaten the patient one may ask if the eventual advantages of early nephrectomy do not exceed its risks.

According to Brongersma, statistics show that the original focus of infection does not continue to distribute tubercle bacilli after the nephrectomy, and in any case the presence of the tuberculous kidney forms an additional focus which will tend to diminish the resistance of the individual against tubercle.

The contra-indications to nephrectomy are :—

(1) Bilaterality of the lesion.

(2) Tuberculous lesions of other organs.

(3) Depressed general state of the patient.

(1) *Bilaterality of the Lesion.*—This is not an absolute contra-indication to interference even if the lesions of both kidneys are tuberculous. It may happen that the state of one kidney is a menace to life by the toxic effect it produces while its functional value is of no importance and that the lesions of the other kidney, which has performed the function for both are not extensive. In this case Brongersma recommends nephrectomy. Further, although albuminuria and tube casts are present, nephrectomy is not contra-indicated if the function of the kidney is otherwise normal. Simple albuminuria does not contra-indicate operation. Albarran has insisted on this point. He has shown that a large amount of albumin may be present in the urine of the second kidney after nephrectomy : this usually disappears. Sometimes it

persists for years while the function of the kidney remains good.

Heresco says that the determination of the renal function in these cases obviously cannot be made by simple clinical means and the new methods of exploration must be used. Cystoscopy sometimes reveals a limited vesical lesion surrounding one ureteral orifice, and the integrity of the other ureteral zone raises a strong presumption that the corresponding kidney is performing its function well. Finally, the examination of the separated urines by means of ureteric catheterization gives complete information. When the patient has a well-developed tuberculous pyonephrosis and the small capacity of the bladder renders catheterization of the ureters impossible the function of the kidney may be approximately determined by the methylene blue method. A good elimination will demonstrate a sufficient functional power of this kidney although it leaves a doubt as to the presence of early tuberculous or other lesions.

Kümmel is satisfied in such cases with the cryoscopy of the blood, while according to Rovsing and others the quantitative estimation of urea and chlorides in the urine is a sufficient indication of the state of the kidneys.

Cystoscopy and ureteral catheterization are necessary for the diagnosis of the rare cases of tuberculosis of a solitary kidney. Nephrectomy is impossible in such a case, but where one-half of a horse-shoe kidney is tuberculous, it has been removed and a cure obtained. Guisy holds that when both kidneys are tuberculous operation should be rejected.

(2) *Tuberculous Lesions of other Organs.*—If the lesions existing simultaneously in other organs are so slightly advanced that one can still hope they will be benefited by operation on the diseased kidney, nephrectomy is not contra-indicated. In tuberculosis of the bladder and genital organs an amelioration of the symptoms is constantly seen after nephrectomy. Heresco holds that tuberculosis of the genital system is not a contra-indication, nor is early tuberculosis of the lungs, but when cachexia is present in addition nephrectomy is contra-indicated.

(3) *General Condition of the Patient.*—Where there is reason to suppose that in addition to the diseased kidney other tuberculous lesions contribute largely to the bad general state nephrectomy is contra-indicated. The cachectic state does not contra-indicate nephrectomy if the renal lesion is the sole cause. According to Guisy, when one kidney is tuberculous, and the general state of the patient is bad, nephrectomy is indicated. The mortality of nephrectomy by different surgeons varies from 2.77 per cent. up to 17 per cent. If we examine the statistics of these surgeons obtained before and after the introduction of the modern methods of diagnosis in renal surgery we can prove that the cause for the improvement in their statistics is due to the use of these methods. Kümmel in his personal statistics had a mortality of 10 per cent. before he began to use ureteral catheterization, and only 3 per cent. since he has employed this method.

Raffin had 43 per cent. before, and 5.5 per cent. since, he used ureteric catheterization or separation of the urines.

Albarran, who had a mortality of 28 per cent. before, had only 1 per cent. after, the application of ureteric catheterization.

*Technique of the Operation.*—The lumbar extra-peritoneal operation is that universally recommended. An extra-capsular nephrectomy should be performed except where sclerotic perinephritis accompanies a large suppurating kidney, when a subcapsular operation should be done.

*Ureter.*—The ureter should be cut across with a Pacquelin cautery as low as possible after being tied with catgut.

In 56 cases of nephrectomy recorded by Brongersma there were three fistulæ. One closed after four months, one after six months, and the third necessitated ureterectomy five months after nephrectomy and this was successful.





ON INTERMITTENT CLAUDICATION,  
WITH REPORT OF A CASE DUE TO VENOUS, NOT ARTERIAL,  
AFFECTION, FOLLOWED BY RECOVERY.

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THE literature of intermittent claudication has recently had some valuable and interesting additions by first rate clinical observers. There has been a tendency, however, to associate the condition too exclusively with arterial degeneration and its deficiencies, and to overlook, or fail to recognise, that the same train of symptoms may be produced by an affection of the veins, while the arteries apparently retain their normal attributes. There is no fear now of dissociating arterio-sclerosis and intermittent claudication, for every reference to the ætiology and pathology of the latter lays stress upon its relation to the former, and there is ample proof of the existence of vascular changes in the examination of limbs amputated for the ultimate gangrene of arterial obstruction in post-mortem examinations and in the dissection of horses which have been the subjects of such lameness. I do not know that there is any case published where intermittent claudication followed ligature of the iliac artery, but Charcot,<sup>1</sup> quoted by Erb,<sup>2</sup> has recorded one, caused by an iliac aneurysm, which had resulted from a bullet wound of that vessel. The important rôle of the arteries in the causation is suggested by Marinesco<sup>3</sup>—also quoted by Erb—who writes of “angina pectoris, which is nothing else than intermittent claudication of the heart,” a suggestive and felicitous definition. A search for cases due to venous affection, however, produces scanty results. Indeed I have only been able to find reference to the affection of arteries and veins together. Dutil and Lamy<sup>4</sup> found in one case arterio-sclerosis, and along with this “the veins are still patent but with thickened walls,” and later on “in the veins is a like disease (to the arteries) but less intense.” Also in Marinesco’s case, the examination of a limb amputated for

gangrene after intermittent claudication showed a condition of hyperplasia of all the arterial coats, and "similar and equally advanced changes were found in the small arteries and veins of the muscles, especially in the veins." Erb cites a case, recorded by Laveran,<sup>5</sup> in which, in addition to arterio-sclerosis, there was "in the veins as well endophlebitis," and also one by Panas,<sup>6</sup> in which, in the amputated limb, arteries and veins were much reduced in size.

Though I have not been able to discover a recorded case where the veins only were affected, Observation 12 in Erb's<sup>2</sup> paper is very suggestive. The case was that of a man, aged 56, of healthy body and habits, who two years previously had been seized with a sudden pain in the left leg, supposed to be sciatica, but which did not yield to treatment, and he developed a typical intermittent claudication. He had no cyanosis of the feet or subjective coldness. The right leg was affected to a less extent. *In all the foot arteries the pulsation was full and normal.* Erb admits that this could not be due to arterial sclerosis of the larger trunks, but suggests that it is of the "muscular arteries." Even the fact that the patient had "medium arterio-sclerosis, especially in the radials," cannot affect the fact that, with intermittent claudication in the lower extremities, he had "full and normal" pulsation in the foot arteries. Bramwell, too,<sup>17</sup> gives, in scanty detail, notes of a case in which intermittent claudication was typically developed, and yet the arteries to all examination were apparently healthy and their pulsation normal.

In 700 observations on "practically healthy people" between the ages of 3 and 81 years, Erb<sup>2</sup> found anomalies in the pulsation of the foot arteries in 4 per cent., but in no case with healthy vessels was pulsation absent in all 4 foot arteries. It would be illogical to conclude that because pulsation was "full and normal," therefore the pulsating vessels were healthy. At the same time Erb's explanation of the phenomena in his Observation 12 is scarcely satisfactory. He points out, what is perfectly well known, that advanced arterio-sclerosis may be present even with absence of pulsation in all 4 foot arteries, and yet no intermittent claudication; and it is known to all surgeons that gangrene may result from arterio-sclerosis and atheroma, and not have been preceded by

any of the symptoms of intermittent claudication, though by all of diminished arterial supply. It seems to me that the condition of the veins has been taken too little into account in cases of intermittent claudication, and that further investigation may prove that the condition depends not only on deficient arterial supply producing an ischæmia of the muscles, but also on interference with the removal of the blood and effete products from the working muscles. Such interference would be caused by obstruction in front, for no one believes that the arterial pulsation makes a *vis a tergo* and drives the blood through the *veins*. What is required for the explanation of some cases is a retardation of the venous circulation, without, or in addition to, simple ischæmia to produce intermittent claudication.

I believe the following case illustrates the importance of a venous affection in intermittent claudication, for that was undoubtedly the paramount, if not the sole, factor in its production.

In August 1907 there was referred to me an architect, aged 72, who complained of pain of some 18 months' duration in the left loin during walking or standing. He had had, on the whole, exceptionally good health, though, previous to twelve years ago, he used to suffer from "bilious attacks" about every three months, characterised by headache, constipation, and rarely vomiting. He had been invariably temperate, almost to abstinence, and most moderate in the use of tobacco; a man of regular habits and placid nature. One Saturday in December 1905 he was quite well previous to going to see a building under construction, when he felt a curious sensation in the abdomen accompanied by a desire to stool, and had to seek the nearest watercloset, where he had an unusually large motion of a very bilious and dark character. This attack was all the more unexpected as he had already had his usual matutinal evacuation. He pursued his work, however, and returned home at his usual time, and though feeling a little "down" thought nothing of it. His intention to lie up for twenty-four hours was frustrated by a friend, at whose solicitation he went for a walk, from which he returned more than usually tired by the exertion. He went to bed at his usual time and passed an ordinary night.



Next morning (Sunday), however, because he was not quite up to the mark, he remained in bed till afternoon, and then, though not feeling well, stayed up till his usual hour for retiring. Either that afternoon or on the following (Monday) morning, he thought the right thigh was swollen. The bowels moved as usual, but as the swelling of the limb increased he sent for his doctor, who informed him that he had thrombosis. He was confined to bed for three weeks and suffered much from pain in the limb and want of sleep. He was then up for a few days before an attack of hæmoptysis, produced, the doctor said, by a clot in the lung, caused him to spit up "fully a teacupful" of blood. Altogether he was in bed for eight weeks, and it was while lying after the pulmonary attack that the left leg became affected. It was never swollen, but was a great deal more painful than the right had been. While in bed he had pain below the left knee, for which he applied hot fomentations, but later the pain seemed to settle "about the hip joint." For months he could not lie on the left side, and for more than a year he had pain about the left groin which was much increased by exertion. At the end of eleven weeks from the commencement of his illness he was able to go to his office for a little, though he used occasionally to take "faint turns."

When I saw him in 1907, he complained of pain in the upper half of the left thigh. Frequently this was followed by "dry retching," which he thought relieved the pain, though he had no actual vomiting. The spasms came on mostly about mid-day after he had been moving about, troubled him only after exercise, and never while resting or in bed. A tendency to constipation necessitated an occasional laxative. He had at no time any urinary discomfort. He could travel with perfect ease either in a carriage or train, however uncomfortable the seat or rough the jolting. The pain, if severe, occasionally passed into the left testicle. There was no sign of hernia and examination per rectum was negative. Though well nourished for his age, he stated that he was thinner than formerly. He never had any discomfort while sitting or lying, and the pain had "never been there and gone away" while exercise was continued. Indeed to relieve each seizure he had to stand still or sit down for a little, or, more efficacious still,

lie for a few minutes. There never had been any discolouration of the left foot, nor any tendency to coldness in either, nor "dying" of the toes; and the arterial pulsation was felt normally in the femoral, popliteal, dorsalis pedis, and posterior tibial arteries on the affected side, and was not in any way different from the arterial pulsation on the corresponding side.

I had the opportunity of re-examining this patient in August, 1909, and found that he had entirely recovered so far as concerned the intermittent claudication. True, he is a man advanced in life, being now in his seventy-fifth year, and therewith has undoubtedly senile changes, evidenced by some breathlessness during forced walking or going up a hill, and some hypostatic œdema equally in the lower limbs. The skin is of fine texture, healthy, of normal colour, and practically hairless on the limbs, nor is there any sign of varicosity either in the large veins or their tributaries. He can now walk any distance without pain, being only restricted on over-exertion by breathlessness, which is probably cardiac and senile in its origin. The nails on the limbs are to all appearance normal, and he has no stiffness or "sleepiness" in the limbs on rising in the morning, or at any other time.

A most noticeable feature in this case is that, with the patient's unexceptionable habits, and his previous good health, he presents so few of those senile changes which one expects in a man of his years. There is no tortuosity of his temporal, nor signs of atheroma or sclerosis of his radial arteries and no cardiac defect exists.

The diarrhœa which ushered in his illness was evidently due to some temporary condition of the intestinal contents, for it did not recur, but I have no doubt that it produced that change in his blood which led to increased liability to coagulation. What followed the attack of diarrhœa must have been a venous thrombosis to account for the pulmonary attack, and the primary clot had formed in the right external iliac vein, possibly at the flexion of the vessel as it enters the thigh. The occlusion must have been temporarily complete to cause the typical phlegmasia dolens in the right limb, and the clot probably extended up into the common iliac vein and into the inferior vena-cava. There is no evidence of the left iliac vein participating; it could certainly not have

participated to any great extent, though the orifice might have been slightly diminished. The imperfection of such obstruction would have accounted for the absence of swelling in the left limb, though the circulation had been interfered with sufficiently to cause pain, and it must be remembered that he was recumbent during this period. Later on, as the intermittent claudication developed, the absolute and almost immediate relief by resting, no discomfort while sitting or lying, and the onset of the pain during standing, and much more readily, certainly and severely, during walking, and this in proportion to the amount of standing and walking indulged in, were its attributes during his illness.

The pain was located in the left inguinal region, scarcely passing as low down as mid thigh, and not following the distribution of the ilio-hypogastric or ilio-inguinal nerves, as pain may from pressure in the inguinal canal by an incipient hernia. It was situated deep in the left inguinal region, or vaguely in the left iliac fossa, and it passed down to about the level of the insertion of the ilio-psoas muscle, and, coming on only during, and with severity in proportion to, its use, seemed to point to a cause exclusively involving that muscle. In the absence of evidence of arterial degeneration throughout the body, in the presence of proof of efficient circulation in the lower limbs, it cannot be entertained that arterial degeneration was the chief, if at all, a factor in the production of the symptoms. There can be no other explanation than that a clot had formed extending along the left side of the inferior vena-cava, interfering with the free return of blood from the common iliac and from the lumbar veins. It would be an extraordinary event to have a vaso-motor spasm affecting solely the ilio-psoas muscle. The muscles whose blood return depends on the patency of the affected veins would, were obstruction caused, easily become overloaded with the effete material produced by exercise, and this could only be obviated by a temporary cessation of muscular function. The congestion or these muscles (I refer specially to the ilio-psoas) would result in some stimulation of the second and third lumbar nerves, which would account for the sympathetic pain down the front of the thigh through the anterior crural. It is well known how common cramp is in the muscles of the calf in conjunc-



tion with ordinary varicose veins ; an analogous condition would exist in the ilio-psoas with an obstructed venous return, and pain would result of a cramping character, and inguinal, iliac, or abdominal in site. At no time did the pain of intermittent claudication extend over the whole limb or appear in the foot or calf, therefore we may infer that as the arterial supply to the limb was sufficient so the venous return was satisfactory. Thus the assumption is justified that the external and common iliac veins had remained patent to efficiency.

The clot on the right side which caused the original thrombosis must have been reabsorbed (part of it was detached, as evidenced by the pulmonary affection) with a completeness which is not uncommon, for the vascularity in the right limb is now perfect and there is no abnormal dilatation of venules evidencing the establishment of a collateral circulation. On the left side the recovery has been slower, but none the less satisfactory, and it is possible that either a collateral circulation has been set up to relieve the obstructed left lumbar veins, or that the thrombus has been tunnelled.

Surely the above explanation is possible and deserves consideration. The suddenness of onset is against a gradual arterio-sclerosis, nor were this the cause would perfect recovery be looked for. In Erb's Observation 12, the original onset seems to have been rapid if not sudden, and the pain diagnosed as sciatic. His explanation of this particular case seems inadequate. He writes :<sup>7</sup> "Perhaps we can make the assumption to account for the absence of nervous symptoms, especially of intermittent lameness, that the sclerosis has attacked the large arteries and not the muscular and nerve arteries in like degree, which perhaps would be the deciding arteries for this symptom." This seems to me far-fetched. It is obvious that atheroma is not as likely to produce such a syndrome with intermittent claudication. Erb's suggestion that his case may be explained by the supposition that arterio-sclerosis extends "principally over the deeper-seated muscular and nerve arteries which are not accessible for examination, and from these arise the symptoms; and that before all temporary conditions of vaso-motor excitement may be present which cause the nervous symptoms in relatively intact arteries," is surely a less likely explanation than that the sudden onset, and the subsequent lameness, might be caused

by an interference, not so much with the blood supply, as with its return, as I suggest has occurred in my case. This means venous obstruction, which, if high enough, will certainly affect both limbs, though probably to an unequal extent. Even if admitting with Erb that "not only purely mechanical anatomical alterations play the principal rôle in the causation of the symptoms, but that doubtless functional dynamic conditions, temporary narrowing and widening of the vessels—in other words changing vaso-motor disturbances—co-operate in a considerable degree," it must be insisted that the "purely mechanical anatomical alterations" are so overwhelmingly important that for practical purposes the alternative may be disregarded altogether, and it may turn out that the veins are not so exempt from participation as recorded pathological observations would lead us to expect.

Byrom Bramwell,<sup>8</sup> working on the same lines, seems to disregard the possibility of venous affection, for he tabulates as essential characteristics of intermittent claudication (1st) absence of symptoms while the affected parts are at rest; (2nd) the development of symptoms after exertion; (3rd) the disappearance of the symptoms after rest; and, in most cases, (4th) the absence of pulsation in the pedal arteries.<sup>17</sup> The last of these is certainly not essential. Erb's Observation 12,<sup>2</sup> Bramwell's Case 3,<sup>17</sup> and my case given above are alone sufficient to establish that point. An angio-sclerosis, not a pure arterio-sclerosis, may cause intermittent claudication, but the term must not be used in too narrow a sense, and must include venous as well as arterial degeneration. Turning to comparative pathology, we gain but little information as to the condition of the veins. It seems as if the prominence of an arterial affection had led observers not to look for possible co-existing venous involvement. More than this might have been expected, for intermittent claudication was recognised in horses long before it was described in man, and since Bouley<sup>9</sup> described it in horses in 1822 there has been abundance of cases published in veterinary records.\*

Associated with the symptoms in horses is found thrombosis of the iliac arteries,<sup>10</sup> a clot in the aorta,<sup>11</sup> "acute

\* Bramwell<sup>8</sup> makes the unfortunate statement that intermittent claudication in horses is known as "stringhalt."<sup>17</sup> This error requires correction, for "stringhalt" is an extremely common affection, and is the very antithesis of

thrombosis,"<sup>12</sup> thrombosis of the posterior aorta spreading into the iliac,<sup>13</sup> chronic embolism,<sup>14</sup> clot in the termination of the posterior aorta spreading to the external and internal iliacs,<sup>15</sup> and the condition is said to be unimprovable—no recovery.<sup>16</sup>

These lesions as recorded seem to be more gross than in the human subject. The size and extent of the clot is commented on, not the state of the vessel wall. There is not the same arteritis obliterans, and as mention is never made of the veins one fears they were not examined as a routine. In one case<sup>13</sup> there was "considerable hypertrophy of the heart," though it is not suggested that this is due to arterio-sclerosis. Indeed in horses the condition seems to be much more a local than a general one. Otherwise there is great similarity between the human and the comparative symptomatology of intermittent claudication.

Finally, one must conclude that the human and comparative pathological evidence is all in favour of affection of the arteries only, and interruption of the blood supply to the affected muscle; but clinical evidence has collected facts which cannot be explained on such hypotheses, and one must offer some other suggestion or supplement that already made.

The conclusions to which I am led, therefore, are as follows :—

*First.*—That arterio-sclerosis is so common, and the condition of intermittent claudication so rare, that it is inconceivable that arterio-sclerosis alone can always be the cause of intermittent claudication.

*Second.*—That intermittent claudication may be due not only to interference with the blood flow *to*, but also to interference with the blood flow *from*, the affected muscles.

Intermittent claudication. Møller,<sup>16</sup> defines stringhalt as a peculiar involuntary movement of one or both hind limbs, in which the affected member is flexed with excessive suddenness, and lifted abnormally high, whilst it still continues able to support the animal and otherwise allows of movement in the usual way. It comes on without pain at the very commencement of exercise, and often diminishes with, though it certainly does not preclude, muscular exertion. Intermittent claudication, on the other hand, comes on after muscular exertion has been continued for a longer or shorter period; it increases with the continued effort to use the affected muscles, and is characterised by a hopeless lameness and stiffness in the limbs, absolutely different from the spasmodic jerkiness of stringhalt.



*Third.*—That intermittent claudication may be typically developed if the interference be only in the removal of the blood, *i.e.*, in the efferent veins.

Clinicians recognise the existence of cases not explainable by mere ischæmia. I would plead that they appreciate the significance of such rare cases, and I would urge that pathologists do not rest content with discovering arterial changes, which are known to exist in other cases without a symptom of "intermittent claudication."

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SOME POINTS IN THE SURGICAL TREATMENT  
OF GOITRE.

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IN considering whether surgical treatment should be adopted in a case of goitre many points require investigation, and it is proposed to consider some of them in this paper.

It is important to remember that a large number of cases of enlarged thyroids do not require surgical intervention. A great many persons who have a goitre can be perfectly well treated by medical measures, but it must be clearly recognised that only some kinds of goitre are benefited by the use of drugs, and hence it is always necessary to determine the nature of the enlargement before deciding on the method of treatment. Many cases of parenchymatous enlargement yield to medical treatment, whilst adenomata are not affected. As an illustration I may quote the case of a boy, aged 10, who is the brother of the patient No. 16 in the accompanying list of cases, and who was brought to me for operation. Both lobes of the thyroid were uniformly enlarged and formed a very obvious tumour; there was no dyspnœa. He was given a mixture containing iodine  $\mathfrak{m}$  iii. and potassium iodide grs. v. three times a day, and thyroid extract grs.  $2\frac{1}{2}$  daily. The tumour began to diminish, and has steadily decreased in size so that now it is hardly perceptible. The sister of this patient had a goitre, due to the presence of multiple adenomata, and these would not be affected by such treatment; hence an operation was done in her case. When a goitre is present in a child it is generally a parenchymatous enlargement. These goitres are prone to increase rapidly in size at about the age of puberty and to cause severe dyspnœa; under these circumstances an operation is indicated and should not be delayed, as it may then have to be done under very unfavourable conditions, and a comparatively simple proceeding becomes one of difficulty and often is dangerous. Therefore all these young patients must be carefully watched, and if the medicinal measures do not cause a definite and early diminution in the size of the tumour, or if dyspnœa persists or comes on, operation should be undertaken forthwith.

Enlargement of the thyroid may be due to parenchymatous changes, to the presence of adenomata, to malignant disease, or to exophthalmic goitre. The great majority of cases will be included in the first two classes, but malignant disease is not very infrequent. Exophthalmic goitre will not be considered here, as its surgical treatment would require a special article.

The term "parenchymatous goitre" includes all cases of general and more or less uniform enlargement of the whole gland; it does not include the exophthalmic goitres. The general shape and contour of the gland is retained, but one lobe may be larger than the other, resulting in some inequality of the size of the tumour on each side of the neck. The trachea retains its position in the mid line of the neck, but is bilaterally compressed and therefore its lumen is narrowed. This compression is the cause of the dyspnœa, and it will be evident that the small trachea of a child or young adult will suffer much more severely than the larger, more rigid, trachea of an adult. Hence the rapid onset of dyspnœa in a child, which has already been referred to. The retention of the normal position of the trachea is a valuable aid to the diagnosis of the kind of goitre present.

Adenomata are encapsuled tumours composed of thyroid tissue, and form the more common variety of goitre in adults. They may be single or multiple and confined to one lobe; frequently they are present in both lobes. When they are large and multiple there is also some general increase in the size of the gland. They may develop in a parenchymatous goitre, and hence there is an adeno-parenchymatous type. Adenomata are globular or oval in shape, and when one lobe is affected, or when they are more numerous and are larger in one lobe than in the other, the trachea is usually displaced to the opposite side of the neck, and at the site of the compression it may have a considerable curve; the larynx may also be displaced. These changes are the cause of the dyspnœa, and the alteration in the position of the trachea and larynx is of great assistance in the diagnosis of the presence of adenomata. The tumour has a distinct capsule, which is quite separate from the gland capsule, this being formed by the cervical fascia, and is outside the gland proper. When the operation



of enucleation is performed, the capsule of the thyroid and a layer of gland tissue have to be divided before the tumour capsule is reached; the latter must be incised before the tumour can be enucleated. The layer of thyroid tissue which intervenes between the capsule of the tumour and that of the gland may be thick or thin: it is thick when the adenoma is deeply placed; it is thin when the tumour is a large one, and the two capsules may be practically in contact, owing to the atrophy of the proper gland tissue. The capsule of the tumour is formed by connective tissue and thyroid tissue, altered by compression and atrophy. With a little experience in operating it is generally easy to recognise that the tumour capsule has been opened; if it is difficult to recognise that this has been done at one place, the proper layer can be demonstrated by making an incision at another spot where the gland is thicker. The tumour is recognised by its colour being different to the red colour of the gland; it is often greyish or bluish and more opaque looking.

Adenomata may be solid, but they are liable to degenerate, becoming cystic, and the vast majority of cystic thyroid tumours originate in this way. A solid adenoma may be so soft and elastic as to appear to fluctuate. From the point of view of treatment it is not very important to make a distinction between solid and cystic tumours, both are treated in the same way, viz., by enucleation. A cyst of the thyroid should never be tapped or injected. When an adenoma has been long existent it is very likely to contain a lot of fibrous tissue and to have calcareous particles or masses deposited in it. The tumour then becomes firm or hard, and this may suggest a malignant change.

Hæmorrhage into a cyst is an important and not infrequent event; it may cause a rapid increase in size and severe dyspnœa, which has been fatal on many occasions.

The effect produced on the trachea, and the ease or difficulty in performing an operation, depend on the situation and size of the tumour. A large prominent goitre high up in the neck may cause little dyspnœa and be readily removed; a small deeply placed goitre low down in the neck may cause much dyspnœa and be difficult to remove. A goitre which is placed low down in the neck may be partly or wholly

intra-thoracic ; as it enlarges, either gradually, or rapidly and suddenly from a hæmorrhage into it, the trachea may be severely compressed and intense dyspnœa may follow. All these goitres should be operated on, as well as those freely movable ones which can be pushed down behind the sternum or clavicle. When a goitre which is placed low in the neck is being operated on the upper opening of the thorax should always be examined to make certain that the whole tumour has been removed, and that no part is in the thorax. Cases 11 and 20 are illustrations of this fact ; in Case 11 the right lobe was removed on account of multiple adenomata, and then a deeply placed tumour was enucleated from behind the sternum ; it had originated in the left lobe and was the main cause of the symptoms. In Case 20 a very large adeno-parenchymatous enlargement was present ; there were numerous adenomata in both lobes ; resection-enucleation of the right lobe was done, a portion at the upper pole being left. A large adenoma originating in the lower part of the right lobe was then shelled out from behind the sternum, and smaller ones from the left side were also enucleated.

Fortunately these deeply-placed tumours are usually easily removable by the operation of enucleation, especially if they are partly cystic, for their size may be diminished by evacuating the fluid contents. In every case the close proximity of the great vessels must be remembered, and care exercised not to damage them, by keeping close to the tumour.

In all cases of goitre the interior of the larynx should be examined (1) to see if the cords are normal and move freely ; (2) for any other effects on the larynx and trachea--the displacement and narrowing being often visible. The vocal cords are practically never affected by an innocent goitre ; if they are paralysed, or one moves less freely than the other, a malignant goitre is strongly suggested. The dyspnœa in innocent tumours of the thyroid is not due to interference with the mobility of the vocal cords ; in malignant disease, it is partly due to paresis of these structures. In innocent goitre the voice may be weak, and there may be some stridor, owing to the obstruction to the passage of air through the trachea ; in malignant disease the voice is often husky.

Malignant disease of the thyroid may be carcinomatous or

sarcomatous. Most commonly it develops on a pre-existing enlargement of the gland, which may have been present for a long time; a long-standing goitre which begins to rapidly increase should always raise the suspicion of malignant disease. This increase, however, may be caused by hæmorrhage, and it is not always possible to make a diagnosis between these two conditions. The practical point is that such a goitre should always be operated on without delay, for it is only by the removal of malignant goitres whilst they are still confined within the gland capsule and are not adherent to the surrounding structures, that there is any possibility of curing the patient. Moreover, the only means of effectually dealing with a hæmorrhage into a cyst or an adenoma is to remove the tumour. Cases 18 and 22 illustrate the difficulties in making a correct diagnosis between these conditions.

*Case 18.*—The patient was a woman, aged 48, who had noticed the swelling for 18 months. During the three months before she was seen it had rapidly increased in size. The right lobe was as big as an orange, and formed a hard tumour which was not freely movable. The trachea was displaced to the left, and the vocal cords moved freely; the left lobe of the thyroid was slightly enlarged. The right lobe and isthmus were removed, and from the left lobe two adenomata were enucleated. The tumour on the right side was solid, of a pale yellow colour, and contained one small cyst. Microscopically it belonged to the variety known as *fatal adenoma*, a type of tumour which is often very vascular. The alveoli were filled with cells and contained no colloid; there was a large amount of inflammatory interstitial tissue. No evidence of malignant disease was found, and the patient continues quite well—more than nine months since the operation.

*Case 22.*—The patient was a woman aged 52. The swelling had been noticed for three months, and was rapidly increasing in size and had caused some dysphagia. This symptom is always suggestive of malignant disease, for it rarely occurs with an innocent goitre, however big this may be. On examination a large hard globular tumour was found in the right lobe. It moved up and down on swallowing, but it could not be moved laterally. The carotids were displaced backwards, and the trachea to the left; the vocal cords were not paralysed.



A diagnosis of hæmorrhage into an adenoma, or possibly malignant disease, was made. At the operation the latter was found to be correct, and the tumour was only partially removed ; it was adherent to the pharynx, œsophagus and trachea. Numerous enlarged lymphatic glands were lying along the internal jugular vein, behind the growth ; these had not been detected previously to the operation.

In malignant disease it is not uncommon for lymphatic glandular enlargement to be absent, and this fact should not be allowed to weigh against the diagnosis if the other signs are suggestive. To wait for the discovery of such enlarged glands always means that the favourable time for operation has been allowed to pass.

Malignant thyroid tumours are usually hard and nodular and grow rapidly. They soon penetrate the capsule of the gland, and become adherent to, and infiltrate, the adjacent structures, especially the larynx, trachea, œsophagus and pharynx, giving rise to dyspnœa and dysphagia. It should be carefully noted that so long as the tumour is not adherent to fixed structures, such as the sterno-mastoid and vertebral column, movements on swallowing will continue ; hence the mobility of the tumour, apart from swallowing, should always be carefully examined.

If the food and air passages are involved it is practically hopeless to attempt to rid the patient of the disease. Moreover, in operations for malignant disease the trachea or pharynx is very likely to be wounded, as they are often thinned or penetrated by the growth, a fact which may only be discovered during the operation. This happened in Case 22, in which the trachea was opened. Such an accident is very often fatal.

#### INDICATIONS FOR OPERATION.

From the accompanying table of cases it will be seen that the most frequent reason for operating was dyspnœa. The degree of dyspnœa, of course, varied, but the more severe it is the more urgent is the need for operation in non-malignant cases. In malignant disease it may not be possible to do more than a tracheotomy, but this operation should never be performed for the relief of this symptom in an innocent goitre ; the right thing to do is to remove the tumour causing the dyspnœa. Displacement or compression

of the trachea are frequent indications for operating. At any time the pressure may increase, and there is usually in these cases dyspnoea, stridor, and an alteration in the voice. Continued growth and the deformity, which is the result of a large goitre, are also reasons for operating. A very prominent unilateral goitre may not cause difficulty in breathing, the tumour having grown forwards, pushing the superficial structures in front of it rather than exercising pressure on the air passages. Nevertheless, a goitre which has reached a large size may at any moment begin to produce severe symptoms. Other reasons for operating are rapid increase of the tumour, suspected malignancy, and early malignant disease. The case of exophthalmic goitre (Case 24) was operated on chiefly on account of the size of the tumour and the amount of dyspnoea; the patient had been treated medicinally for a long time without any beneficial effect. The case of acute suppuration (Case 23) has been fully reported elsewhere. (*Lancet*, Vol. I., 1908, p. 228.)

#### THE NATURE OF THE OPERATION.

Before proceeding to operate it is essential to determine whether the goitre is due to an encapsuled tumour or is caused by a general enlargement of the whole gland. If it belongs to the former type, intraglandular enucleation or its modification, resection-enucleation, should be performed; if it is of the latter type, extirpation or resection-extirpation is employed.

In enucleation the gland itself must be incised before the tumour can be enucleated, and a spot where there are few vessels should be chosen for making this incision. The tumour capsule is opened, and the adenoma is shelled out; a cavity is left, and in it there will be vessels requiring to be ligatured. The hæmorrhage, which may be smart immediately the tumour is removed, should be temporarily controlled by packing the cavity with gauze, which is removed after a short time; the vessels are then picked up and ligated. In the tumour capsule a vessel or two may also require to be secured. By means of a purse-string suture the walls of the cavity may be approximated; two or three such sutures are generally sufficient.

In resection-enucleation the affected lobe is displaced forwards, and an incision is made through it till the tumour

is exposed. This is then partially enucleated on its inner and posterior aspects, where the gland tissue is again divided; the portion left attached to the tumour is removed with the latter. All vessels in the capsule of the gland must be ligated after being clamped before they are divided, and the position of the recurrent laryngeal nerve on the posterior aspect of the gland should not be forgotten, and care must be taken not to damage it. The cut edges of the gland are united by two or three sutures. This operation is suitable for large adenomata when there is only a thin layer of thyroid tissue over a large area of the tumour.

Extirpation means the removal of the whole of one lobe. In resection-extirpation a portion of the lobe on the inner and posterior aspect is left behind, the knife being carried through the gland in this situation. The advantages of this modification are that the recurrent laryngeal nerve is not endangered, and enough of the gland remains to carry on its function, if it ever becomes necessary to remove the opposite lobe. In both these operations the vessels are ligatured and divided outside the capsule of the gland. Especial care should be taken to secure those entering the lower pole before dividing them; if this is not done, much unnecessary loss of blood will occur, as the veins retract into the cellular tissue behind the sternum and are very difficult to pick up in this situation. These operations are performed in cases of parenchymatous and adeno-parenchymatous goitre, multiple adenomata, malignant disease, and exophthalmic goitre. It is never necessary to remove the whole of both lobes in innocent goitres; only occasionally is it desirable or possible to do so in malignant disease. After the removal of one lobe for innocent goitre the other generally shrinks rapidly, and may almost disappear. If adenomata are present in it, accessible ones should be enucleated. When the isthmus is enlarged it may be entirely or partially removed with the lobe.

It is sometimes difficult to determine which lobe is the proper one to be operated on. Speaking generally, that which is the larger and extends the lower and deeper in the neck is the one to be chosen. Sometimes the least prominent and lowest in the neck is the one causing the symptoms and should be removed. When



the operation is being done for adenomata the lobe which is causing the displacement of the trachea is the one to be attacked.

As already mentioned, an intra-thoracic goitre may be present, and therefore the region behind the sternum should be digitally explored, especially when the tumour is low down (Cases 11 and 20), otherwise no relief of the symptoms may follow the removal of the obvious part of the tumour in the neck.

#### DETAILS OF OPERATING.

A curved transverse incision is the best to use ; it is usually placed over the lower part of the tumour ; if an extra amount of room is required, the ends of the incision may be carried upwards. A flap, consisting of skin, deep fascia, and platysma is turned up, and ample room is obtained for the necessary dissection. The scar of such an incision becomes almost invisible, whereas that which is left after the oblique or vertical incision has been made is often very unsightly and may become very hypertrophied or keloid. In suturing the incision three or four stitches should unite the cut edges of the platysma and deep fascia ; these approximate the edges of the skin, and allow the superficial sutures to be removed as early as the fourth or fifth day, and thereby stitch marks are avoided.

The infra-hyoid muscles (which may be very thin and spread out over a large tumour) are divided high up near to their insertion ; they are peeled off the tumour and turned downwards. After the removal of the tumour and before sewing up the skin their cut edges are united by two or three sutures ; these should never be omitted. Sometimes, instead of dividing these muscles, they may be separated and held aside by retractors ; this does not give such a clear exposure of the tumour as their division, to which there is no real objection. A few fibres at the anterior border of the sternomastoid may occasionally require to be divided, but firm retraction of this muscle is usually sufficient.

The tumour is gently raised from its bed by passing the fingers around it, and in doing so the close proximity of the jugular vein on the outer side or in front of the tumour must not be forgotten. Moreover, the pressure on the trachea or the dragging may increase the amount of dyspnœa, and during the whole operation the breathing must be carefully watched for any sign of increased obstruction.

It is essential to make sure that all vessels are securely ligatured before closing the wound. In order to test this point, it is a good plan to let the patient come round partially from the anæsthetic and make him strain. Any unsecured vessels will bleed at once, and can be secured ; the large thin-walled veins collapse and do not bleed unless the patient strains. If this manœuvre is not adopted, and the vessels remain unligatured, much hæmorrhage is likely to occur after the operation is completed, and the wound becomes filled with blood clot, which may seriously press on the air passages, besides interfering with the healing processes.

As there is often a good deal of oozing and escape of blood-stained colloid material, it is advisable to put a drainage tube into the depth of the wound for 24 hours ; a large sized tube should be employed, its superficial end being placed in the middle of the skin incision. The healing of the wound is not interfered with, and much after-trouble may be avoided by employing drainage. In a few cases, when the tumour is small and the cavity remaining after its removal can be obliterated by suturing the surrounding structures, drainage is unnecessary, but these cases are the exceptions.

As soon as the effects of the anæsthetic have passed off the patient is placed in a sitting posture, supported by pillows, on a bed-rest ; this position is much more comfortable than the recumbent one with the head quite low. As a rule the majority of patients may be allowed to get up for a short time on the third or fourth day.

In this series of cases no complications, except slight suppuration in one (Case 17), have followed the operation. Thyroidism so called has been absent ; the temperature in no instance has exceeded 100·4° F., except in Case 17, which suppurated, and in the fatal case of malignant disease. When the isthmus was divided (and in some cases it was very large) no special treatment of it was adopted ; only a drainage tube was placed in the wound. This is important, because the symptoms of thyroidism have been attributed to the pouring out of the secretion into the wound and its absorption therefrom. Moreover, in these cases after the tube has been removed there has been no accumulation of the secretion of the gland in the wound even when the remaining part of the gland has rapidly diminished in size.

| Case. | Sex and Age. | Nature of Growth.   | Reason for Operation.  | Nature of Operation.   | Remarks.   | Result.    |
|-------|--------------|---|--|--|--|------------|
| 1     | F., 51       | Adenomata of both lobes, cysts.   | Dyspnoea, stridor -  | -  | Transverse incision; no drainage; primary union.           | Recovered. |
| 2     | F., 30       | Adenoma (?) from pyramidal lobe.  | Increase in size; diagnosed as thyro-glossal cyst.   | -  | Transverse incision; no drainage; primary union.           | "          |
| 3     | F., 20       | Cystic adenoma, right lobe.   | Occasional dyspnoea; trachea displaced to left.  | -  | Transverse incision; no drainage; primary union.           | "          |
| 4     | M., 20       | Large adenoma of left lobe.   | Dyspnoea; size of tumour, which measured 10½ inches transversely; displacement of trachea.   | -  | Oblique incision; drainage; primary union.                 | "          |
| 5     | F., 44       | Large adenoma of left lobe.   | Dyspnoea; slight stridor; increase in size; tumour could be pushed down behind the clavicle. | -  | Transverse incision; no drainage; primary union.           | "          |
| 6     | M., 50       | Adenoma, right lobe, cyst containing blood clot; wall of cyst calcareous in places. | Dyspnoea; increase in size; displacement of trachea.   | -  | Oblique incision; drainage for 24 hours; primary union.    | "          |
| 7     | F., 14       | Parenchymatous -  | Severe dyspnoea -  | -  | Drainage for 24 hours; primary union.                      | "          |
| 8     | F., 24       | Parenchymatous, right side only.  | Dyspnoea; rapid increase in size.  | Extirpation of right lobe, and part of isthmus.<br>Extirpation of right lobe | Transverse incision; drainage for 48 hours; primary union. | "          |



|    |        |  |   |   |   |
|----|--------|--|---|---|---|
| 9  | F., 49 | Adenoma, left lobe; cystic and calcareous deposits in wall of cyst.                      | Dyspnoea; displacement of trachea to right. | Enucleation -   | Transverse incision; no drainage; primary union.                |
| 10 | F., 44 | Multiple adenomata, right lobe the larger.   | Dyspnoea -                                  | Extirpation, right lobe and isthmus.  | Transverse incision; drainage for 24 hours; primary union.      |
| 11 | F., 37 | Multiple adenomata, right lobe; deeply placed adenoma of left lobe, behind the clavicle. | Dyspnoea -                                  | Extirpation, right lobe; enucleation of adenoma from behind sternum on left side. | Transverse incision; drainage for 24 hours; primary union.      |
| 12 | F., 47 | Adenoma, left lobe -   | Dyspnoea -                                  | Enucleation -   | Transverse incision; no drainage; primary union.                |
| 13 | F., 25 | Multiple adenomata, right lobe the larger.   | Dyspnoea, trachea displaced to left.        | Extirpation of right lobe; enucleation of adenoma from left lobe.                 | Transverse incision; drainage for 24 hours; primary union.      |
| 14 | F., 34 | Multiple adenomata, right lobe.  | Increase in size; no dyspnoea.              | Enucleation -   | Transverse incision; no drainage; primary union.                |
| 15 | M., 26 | Parenchymatous -   | Great size and dyspnoea -                   | Extirpation of right lobe and isthmus.  | Transverse incision; drainage for 24 hours; primary union.      |
| 16 | F., 14 | Multiple adenomata, duration 7 years.  | Dyspnoea and increase in size.              | Extirpation, right lobe -   | Transverse incision; no drainage; primary union.                |
| 17 | F., 45 | Parenchymatous -   | Dyspnoea and large size -                   | Extirpation, left lobe and portion of right lobe.                                 | Transverse incision; drainage for 48 hours; slight suppuration. |

| Case. | Sex and Age. | Nature of Goitre.                  | Reason for Operation.   | Nature of Operation.   | Remarks.  | Result.    |
|-------|--------------|------------------------------------|---|--|---|------------|
| 18    | F., 48       | Adenomata -                        | Dyspnœa and dysphagia ; rapid increase in size ; ? malignant. | Extirpation, right lobe ; enucleation, adenoma, left lobe.                               | Transverse incision ; drainage for 24 hours ; primary union.                                      | Recovered. |
| 19    | F., 24       | Large adenoma, right lobe.         | Dyspnœa ; size of tumour                                      | Enucleation -  | Transverse incision ; drainage for 24 hours ; primary union.                                      | "          |
| 20    | F., 47       | Multiple adenomata -               | Dyspnœa ; size of tumour                                      | Resection - enucleation, right lobe ; enucleation of intra-thoracic adenoma, right side. | Transverse incision ; drainage for 48 hours ; primary union.                                      | "          |
| 21    | F. -         | Adenomata, right lobe ; cystic.    | Size of tumour ; displacement of trachea.                     | Resection-enucleation -  | Transverse incision ; drainage for 24 hours ; primary union.                                      | "          |
| 22    | F., 52       | Sarcoma, round-celled, right lobe. | ---   | Extirpation, incomplete -  | Transverse incision ; trachea wounded ; drainage lived for 12 days after operation ; suppuration. | Death.     |
| 23    | M. -         | Suppurating adenoma -              | Evacuation of pus   | Drainage, two tubes, one in front of the other, behind sterno-mastoid.                   | Transverse incision ; two ounces of pus evacuated, typhoid bacillus in pure culture.              | Recovered. |
| 24    | F. -         | Exophthalmic goitre -              | Dyspnœa ; size of tumour                                      | Extirpation, right lobe and isthmus.   | Transverse incision ; drainage ; late suppuration.  | "          |

## THE TREATMENT OF SCARLATINAL OTITIS, WITH SPECIAL REFERENCE TO THE VALUE OF THE RADICAL MASTOID OPERATION.

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FOR the purposes of the following paper I have analysed the records of the cases of scarlet fever which have come under my care at Monsall Hospital during the last five years, viz., from April 1st, 1904, to March 31st, 1909. I do not, however, intend to go fully into the statistical details thus obtained, but will give the figures, and then mention some of the conclusions to which a clinical study of the subject has led me.

During the above period, 8,685 scarlet fever patients have been discharged from hospital, or have died therein, and of these, 1,708 have had discharge from one or both ears during residence. Compared with some hospitals, the supervention of otorrhœa in 19·5 per cent. of the cases appears at first sight somewhat high, but it is to be remembered that, inasmuch as the incidence of otorrhœa is, *cæteris paribus*, a rough indication of the severity of the case admitted, it is bound to be higher in a city like Manchester, where the proportion of beds available for scarlet fever is very small in proportion to the population, and where in consequence the hospital type of case is always more severe than in places where the great bulk of the patients are removed to hospital.

Of these 1,708 patients, 108 (6·3 per cent.) died, not from any direct result of the aural inflammation, the otorrhœa being simply a concomitant of the intense attack of scarlet fever to which they succumbed; 100 (5·8 per cent.) were discharged from hospital with the otorrhœa persisting, usually on account of the objection by the relatives to their further detention; 260 (15 per cent.) were treated by one or other variety of mastoid operation; while 1,240 (72·6 per cent.) were cured by intratympanic procedures alone, and left hospital without any discharge from the ears.

Before discussing the details of the treatment of scarlatinal



otitis, it may be as well to mention one or two facts about the condition itself which, though familiar to otologists, are perhaps not as well recognised generally as they should be.

The first of these concerns the distribution of the disease and its effect on the community. Some years ago I addressed a circular letter to members of the Otological Society and others with regard to the frequency of scarlatinal otorrhœa in their practice, and it was evident from the replies that of the patients attending out-patient clinics with chronic and more or less intractable otorrhœa, from one-half to two-thirds owed their condition to an attack of scarlet fever. The bulk of these patients, in the large towns at all events, would have been discharged from fever hospitals with running ears.

It is perhaps hardly necessary to dilate on the risks which a patient with an otorrhœa runs, but I may mention that, from enquiries which I have recently made, it is evident that a very large number of insurance offices refuse to accept the life of anyone with a running ear at any premium whatsoever.

In all probability the medical inspectors of school children will in future do much to educate the public on this point, but at present it is obvious that the majority of parents of the industrial class do not pay any attention to a running ear, and some even prefer that it should run.

Then there is a tendency to consider a scarlatinal otitis as identical with, or very similar to, a catarrhal inflammation such as may be caused by cold, sea bathing, or other form of irritation. Really there is a fundamental difference. In scarlatina (and in measles also and in other zymotic diseases) the change consists in an inflammation of the whole tract, namely, the Eustachian tube, tympanum, mastoid antrum and mastoid cells, and not merely in a catarrh of the lining membrane of the tympanum only. The infecting agent is almost always a streptococcus, which enters from the nasopharynx through the Eustachian tube, or in certain "malignant" cases through the general blood stream, also whereas in the "ordinary" otitis the agent is usually a staphylococcus or pneumococcus which enters through the external meatus. Thus in the scarlatinal cases there is an osteitis, where the tract is bony, from the first, whereas, in the catarrhal cases, bone changes do not, as a rule, occur until much later, and

often not at all. Then, too, it is perhaps not always realised that in any patient under the age of 15 years, and in very many adults also, the Eustachian tube, tympanum, and aditus ad antrum are in a direct line, so that it is quite easy for infective matter to enter the antrum at the same time as the tympanum. As a matter of fact, I have seen and operated on cases of scarlatinal origin in which, while the antrum and mastoid cells were full of pus and carious debris, the tympanic cavity was unaffected and the membrane remained unbroken, so it is evident that infection *viâ* the Eustachian tube may miss the tympanum altogether, or rather pass through it without inflicting any damage. On the other hand, any infective matter entering *viâ* the external meatus has to pass round the corner to reach the mastoid antrum and cells. This difference is not merely a pathological one, but has an important bearing on treatment as well.

There is also another difference between the symptoms of the scarlatinal and catarrhal cases respectively. In the former the onset of the otitis is almost always painless. In the great majority of cases the perforation of the membrane takes place while the child is sleeping, and the first sign of anything wrong with the ears is the presence of the discharge on the pillow in the morning: even in adults I have usually been unable to elicit any complaint of sharp or intense pain. On the other hand, a catarrhal otitis is usually very painful until the membrane is ruptured. In scarlet fever the rupture of the membrane is usually complete, and in the majority of cases one sees a large central perforation with just a fringe of membrane surrounding it. So the advice given in otological text-books that the membrane should be perforated artificially is usually superfluous. In the catarrhal cases it is not uncommon to see only a small perforation, and that, it may be, high up in the membrane.

Coming now to the treatment of the cases themselves, it is first necessary to see whether the onset of otitis in scarlatinal patients can be prevented. In the more severe cases, where the naso-pharynx is full of sloughing adenoid tissue, and there is complete nasal obstruction and necrosis of the tonsils or palate, I believe that the incidence of otitis is inevitable, while it does not, as a rule, occur at all in the mild attacks. In

the intermediate cases, however, I am convinced that much can be done in the way of prophylaxis by frequent flushing of the fauces and nose with sterile water or salt solution, an irrigator with a recently boiled nozzle being used for the purpose. If, on the other hand, a glass or rubber syringe be used, not only is the pressure of the fluid inconstant (and usually excessive), but inasmuch as these instruments can very seldom be sterilised, infective matter is apt to be introduced, or carried from one patient to another.

As to the value of the irrigation, I can give chapter and verse. Up to 1906 the throat and nose of every patient in Monsall Hospital were irrigated with the douche and plain (sterile) tap water, and the incidence of otitis remained constant year by year. In 1906, it having been alleged that the douche tended rather to cause otitis than otherwise, it was employed only for the severe septic cases—the subjects of which would probably have developed otorrhœa anyhow. A series was thus obtained of 1,500 patients who had not been douched at all, and it was found that the incidence of otitis had increased from 19·7 to 20·4 per cent. In 1908 the douche was resumed for every patient, and it fell to 10 per cent. On the other hand, I have had reason to believe that it is not advisable to use any chemical disinfectant solution, however mild, for the irrigations on account of the risk of setting up rhinitis.

When the naso-pharynx is blocked with sloughing adenoid vegetations it is desirable that these should be removed, even though the temperature be high and the scarlatinal condition acute. Nothing is gained by postponing the operation until the pyrexia has subsided, and I have never in practice seen any harm result from this early interference. In the septic cases ("scarlatina anginosa"), in addition to the frequent irrigation of the fauces, it is usually necessary to apply some powerful germicide to the tonsils with a swab. Pure Izal is useful in this connection, as it has, when undiluted, an anæsthetic as well as a disinfectant action.

Coming now to the treatment of the otitis itself, we can clear the ground somewhat by noticing the fact that the vast majority of scarlatinal otorrhœas require no further treatment than frequent irrigation of the ears with sterile water or



salt solution. Under this regime, the discharge ceases in from one to three weeks, and the cure is permanent, unless some deafness results from Eustachian obstruction and consequent indrawing of the membrane. This may require treatment later by catheterisation of the affected tube, but while there is discharge from the meatus the catheter should not be employed. In my experience about 60 per cent. of scarlatinal otorrhœas can be cured in this way.

If, however, after a fortnight or so, the discharge has not decreased in amount, and on inspection the tympanum is seen to be full of granulations, further medication is usually required. When the discharge is thick and offensive I have found nothing to equal the instillation of pure peroxide of hydrogen (20 vols. strength) before and after each irrigation, or the tympanic cavity itself may be swabbed with the drug. Some years ago I used to remove granulations with a small curette, and to apply chromic acid or other caustic, but I gave this up, as it was evident that it had not the slightest effect on the course of the otitis, and was often followed by considerable pain. I felt also that the procedure was not altogether devoid of risk, for in two cases it was followed immediately by an acute mastoiditis. I have occasionally removed an obviously carious ossicle, but I have never cleared out the entire tympanic contents through the meatus, as I should in any given case prefer to see what I was doing and adopt one or other of the mastoid routes.

Sometimes, however, the discharge becomes profuse, thin, and watery and the granulations appear pale and flabby. In these cases, provided that the membrane has been destroyed so as to leave free access to the tympanum, irrigation with astringent solutions such as sulphate of zinc with a little carbolic acid (Zinci Sulph. gr. ii. ; Acid Carbol. Liq. gr. v. ; Aq. ad ʒ) followed by instillation of a saturated solution of boracic acid in rectified spirit usually effects a cure in a further ten days or a fortnight. Another useful application in these cases is an aqueous solution of chinosol of the strength of 1 in 500.

We are now left with the fifteen per cent. of patients in whom intratympanic medication has had a fair trial, and yet the discharge persists. In these, the condition as seen with

the speculum is almost always the same: the tympanum is full of granulations, and, on wiping away the discharge from these with a small mop of cotton-wool, it is evident that the pus is coming from the region of the attic, and not entirely from the visible granulations. This points to the presence of carious bone either in the attic, or somewhere on the mastoid side; occasionally bare bone can be felt with a fine probe in the attic or aditus, but this does not exclude its presence also in the mastoid antrum or cells. Only in one-half per cent. of all scarlatinal cases does an obvious sign of mastoid abscess develop externally, so the absence of local œdema or tenderness does not exclude internal mastoid necrosis.

The question is what to do with these cases. Firstly, I have found that a few clear up after two or three months' further intratympanic medication, but only a very few; the remainder suffer from chronic otorrhœa, which, in practice, soon becomes neglected. In a fever hospital two courses are possible, if operation be deemed inadvisable—either to let the patients go home with the usual cautions and advice that treatment shall be continued elsewhere, or to detain them for operation. In the case of well-to-do people (who often, incidentally, do not scruple to ask for, and even more or less demand, the use of the rate-supported hospitals for their children) the patients can be sent home and an otologist called in. But they must be isolated at home, as the discharge is very frequently infectious, and in any given case it is impossible to say that it is not thus dangerous to others.

The parents of the majority of hospital patients, however, cannot afford to isolate their children at home; if they could, they would not send them to hospital in the first instance. Now, in my opinion, we have no right to discharge these patients if we can detain and cure them. Sometimes we cannot detain them, as their parents will not accept either detention or operation. In practice there is abundant evidence, from the reports of Simpson and others, that these otorrhœas are often infective. I have seen myself, not once but again and again, that infection of another patient has followed the discharge from hospital of one suffering from otorrhœa, and one cannot exclude the pus itself as a source of infection, especially as it is practically always teeming with streptococci. From

the point of view of public hygiene, therefore, I believe it to be necessary that they should be detained and treated in the fever hospital.

Clinically, two procedures are possible. Either the operation is limited to the mastoid side, with the expectation that the tympanic necrosis will then subside of itself, and that even if it does not, a further operation can be performed subsequently, or the radical mastoid operation is done at one sitting. The former course is perhaps the most usual, and I have no doubt that in catarrhal cases it is the best, but I believe it to be not well adapted for the scarlatinal cases, as in these, the tympanum does not in practice clear up. As a matter of fact, I used at one time to limit the operative procedures to the removal of all carious bone on the mastoid side, and for some years did not perform the radical operation at all, but the results were not good.

In the first place, the mastoid wound has to be left open, and only fills up by degrees with granulation tissue. In practice this takes at least eight weeks, and in the majority of (scarlatinal) cases the aural discharge persists and the patient is very deaf. Even if the radical operation is then done, the hearing does not, as a rule, improve, and the treatment is prolonged for another six or eight weeks. So I have of late reserved the operation of mastoidectomy for cases of mastoid abscess in the acute stage with local signs.

On the other hand, if the radical operation be performed straight away, the posterior wound can be closed and the cavity is not filled up with solid material, but becomes epithelialised from the edges of the flaps cut in the soft parts, and, provided that the stapes is left, as it almost always can be, the hearing is usually improved. On this point, my own results are as follows:—I have performed the radical operation *ab initio* now in 170 of these scarlatinal cases. Two patients died of metastatic meningitis, but in one case there was reason to believe that this had arisen before the operation was resorted to. In another case the child was completely deaf, and it was found at the operation that the suppurative process had spread to the internal ear. In every other instance the discharge ceased and the hearing improved. These three cases occurred in the first twenty operated on, so that in the



last 150 there has been complete cure and improvement in the hearing.

The average time (clinically, not arithmetically) at which the radical operation has been resorted to is the fifth week after the onset of the otitis.

The results of mastoidectomy have not been so good. Previously to 1903 detailed records were not kept, though, as already mentioned, it was the only operation performed, as I did not then believe that in cases requiring operation, either on account of very persistent otorrhœa or for mastoid abscesses, it was possible to preserve the hearing. Since 1903 mastoidectomy has been resorted to in 90 cases, in 45 for mastoid abscess, or for the treatment of the primary focus in cases which had gone on to pyæmia, with suppuration in joints, &c., or for threatened cerebral or meningeal extension. The majority of these patients were very ill at the time, and 20 died in the acute stage from general scarlatinal infection. In the remainder the otorrhœa eventually subsided, but the patients were left very deaf. In the remaining 45, the operation was done at the time of election for otorrhœa only; in 20 the discharge persisted, and four more required the radical operation before the otorrhœa was checked. In the remaining 21 the suppuration was cured, but in only 10 per cent. was the hearing improved. There were no deaths in this series.

With regard to the technique of the operations, the only point worth mentioning in the mastoidectomies is that care was taken to explore the tip of the mastoid process in every case and to search carefully for any infected cell posteriorly and towards the root of the zygoma; in about one-eighth of the cases pus was found free in the lateral sinus groove. In six instances the vein itself was found to be infected and the clot was turned out, after ligating the jugular vein in the neck. Three of these ultimately recovered, but with impaired hearing.

As regards the radical operation, I believe the most important point is to have a good light, and I have always myself worked with limelight reflected from a frontal mirror of rather long focus. I use rubber gloves, and latterly I have worn a facial mask as well.

Personally, I do not like a burr, and in the last 100 cases I

have practically abandoned its use, nor have I ever used it inside the tympanum or to open the mastoid antrum with. For the ablation of the posterior wall I prefer a fairly large chisel, or nibbling forceps. The wound is always swabbed with pure peroxide of hydrogen at frequent intervals to check oozing. For the reflection of the meatus, I generally use a large single flap, which is rotated downwards and secured to the anterior edge of the skin incision. None of these cases have been followed by facial paralysis, though slight paresis lasting under a week has been observed in five instances. For the after-treatment packing with gauze has been used for a week only, the dressing after this time consisting of irrigation of the wound, followed by the instillation of a saturated solution of boracic acid in alcohol; powder dressings have not been used. At first I used to pack for a longer period than this, but there seems to be less trouble with granulations if the gauze be left off soon. The time elapsing between the operation and the cessation of all discharges has ranged from 4 to 12 weeks, but the great majority have been cured in seven weeks or less. It is possible that the use of a vaccine prepared from the patient's own organisms might be useful in expediting the healing in the delayed cases, but as yet I cannot speak positively on this point.



ON MUSCULO-SPIRAL NERVE INJURY, WITH  
A REPORT OF TWO CASES.

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[With Plate XII.]

CONSIDERING the close anatomical relationship of the musculo-spiral nerve with the humerus, and the frequency of fracture of this bone, and further the casual manner in which such fractures must often be set, it is a matter of surprise that injury to the nerve is not a common occurrence, either at the time of the accident or later by involvement in the callus.

Bowlby, in his book on *Injuries and Diseases of Nerves*, says in a paragraph headed "Nerve injuries complicating Fractures":

"Paralysis of the parts supplied by any nerves may result in various ways in the case of fracture, and it is of some importance to clearly recognise the various causes to which this paralysis may be due.

"1. In any case of fracture one of the neighbouring nerves may be contused at the time of injury, or may be stretched.

"2. The nerve may be compressed by the displaced bone, or by a fragment of bone in the case of a comminuted fracture.

"3. The nerve may be compressed by callus subsequent to the time of fracture.

"4. The nerve may be completely lacerated."

He says further, "Fracture of the shaft of the humerus is more frequently the cause of nerve lesions than similar accidents in any other part of the body. The nerve most commonly implicated is the musculo-spiral, where it lies in the groove in the bone."

Mr. Bowlby's exhaustive treatise was published in 1889, and judging from the number of cases cited of injury of individual nerves, one is I think justified in assuming that he has collected all the hitherto published cases. In spite of this, however, he only gives eleven cases of injury to the musculo-spiral nerve resulting from fracture of the humerus, viz., two by Trelat, two by Bidder, and one each by Erichsen, Ollier, Whitson, Delen, Israel, Tillaux, and Hulke.

Further, these are all due to stretching, contusion, or



pressure of bony fragments or callus. Not one is reported of complete laceration of the nerve.

A case is reported by Pusey of Liverpool in the *British Medical Journal*, 1889, of callus compression. Perusal of the Year Books reveals no further cases except those of Keen's, which I am about to enumerate, and this seems extraordinary, as one cannot think that the condition can be so uncommon. The reason probably is that these cases before they can be successfully reported must have required months or years of treatment subsequent to the operation, and by that time the surgeon will either have lost sight of them, or lost interest in the case.

Professor Keen, of Philadelphia, in the *Medical Chronicle*, 1900, published a series of five cases of musculo-spiral injury the result of fracture of the humerus.

*The first* was a child, aged 6, the injury being a comminuted fracture, the nerve being stretched by a hook of bone. The operation was successful, but subsequent treatment was not carried out, and the ultimate result was unsatisfactory.

*The second* was a case of non-union of the fracture, and the nerve was wholly torn across. The operation consisted of a resection of the humerus, wiring of the bone, and the shortening so produced enabled Keen to refresh the ends of the divided nerve and suture them. The result was considerable improvement in the forearm and hand from the repair of the fracture, but very little improvement in the function of the nerve.

*The third* was that of a child aged 10, where the nerve was completely divided, and the space between the ends measured 5 cm. By stretching this was reduced to 3.5 cm.; and a piece of the humerus of that length was resected, and the nerve united. Galvanism and massage was persevered with, and the result was that "perfect usefulness" of the hand was obtained.

*The fourth* case was an operation performed 13 years after the injury, where the ends of the divided nerve were 9 cm. apart, but by stretching this was reduced to 6 cm. The gap between the divided ends was bridged by 12 strands of catgut passed between the ends of the nerve. Massage and electrical treatment were prescribed, but there was no improvement.

*The fifth* case was a compound fracture of the humerus,

and the operation was performed 22 months after the injury. The nerve was not divided, but was found to be thickened at the site of the fracture. The thickened portion was excised, and the ends sutured after stretching. The improvement was only slight.

In his remarks on this series of cases Professor Keen says, "The result of a secondary neurorrhaphy is frequently not very good. This result is due, I think, to several causes: first, as in several of my cases, from the ignorance and carelessness of the parents little or no after-treatment is carried out, and unless persistent massage, douching, and electrical treatment is systematically carried out for at least a year, and it may be longer, we can scarcely expect any good result. The simple suture of the nerve, leaving the muscles wasted from long disuse, will of itself do but little good. The result in case three is so good that surgeons may well take heart in such cases."

Removal of a portion of the humerus in order to allow of coaptation of the ends of the divided nerve seems to have been first practised by Keen, and in his first case this was doubtless indicated by the fibrous union of the bone, which would have necessitated resection whether the nerve had been divided or not.

In his third most successful case this was deliberately undertaken, probably owing to the suggestion of the second. Although Keen seems to have been the first to have practised this somewhat heroic method of attaining approximation of the divided ends of the nerve, it was suggested by Allis in three cases, but he was not permitted to carry it out. Lobker, in Tillman's *Surgery*, also pointed out that resection of the bone might be employed in order to get the ends of the nerve to meet, and Rose and Carless, in their *Manual of Surgery*, mention having resected the humerus for an injury of the musculo-spiral nerve.

Sherren, in his excellent little manual on "Injuries of Nerves and their Treatment," points out that four methods have been employed to bridge over the gap left between the ends of a divided nerve, viz.:—

1. Transference of a portion of nerve from another source. In the case of the musculo spiral, for instance, a portion of the radial might be excised to fill the gap.

2. Provision of a path along which the nerve may regenerate (tubular suture, flap operations, etc.).

3. Utilisation of neighbouring nerves (anastomosis).

4. Shortening of the limb by resection of bone.

With respect to the last method, he says that "it is only justifiable in dealing with injuries of this nerve, when, as in one of Keen's cases, non-union of the bone is present in addition to the nerve injury."

Regarding the frequency of the injury to the musculo-spiral in cases of fracture of the humerus, Sherren states that it is common. He says:—

"Bruns found involvement of the nerve in 8 per cent. of all cases of fracture of the humerus, and these figures do not exaggerate its frequency, in my experience, although Reithus found it in only 4 per cent. It suffers most often in fracture involving the lower and middle thirds."

To summarise, then, I have shown that the musculo-spiral nerve is the one most usually injured, as the result of fracture of the neighbouring bone, and that the injury may be one of four varieties, the last of which being complete rupture at the time of the injury.

It seems strange, therefore, that I should only be able to find three recorded cases of complete rupture, and these all Keen's. Of these, the result of treatment was very good in one, poor in another, and bad in the last.

I will now give the notes of two cases of injury of the musculo-spiral nerve due to fracture of the humerus; the first being one of complete division of the nerve, and the other a unique case (I should think), as the nerve was driven between the ends of the bone completely to the inner side, and then was involved in callus.

#### A CASE OF RUPTURE OF THE MUSCULO-SPIRAL NERVE, THE RESULT OF FRACTURE OF THE HUMERUS—NERVE SUTURE—RECOVERY OF FUNCTION.

The patient, a man aged 23, was first seen by me in November, 1906, in consultation with Dr. Johns, of Hornsea.

In the month of June, 1906, he had fractured his right humerus, this was put up in splints, and when they were removed he found that he could not extend the wrist.

In November he consulted Dr. Johns, who diagnosed com-



pression of the musculo-spiral by callus, in which I concurred, and advised immediate operation.

He was admitted into the Hull Royal Infirmary on November 29th, and the operation was performed on December 1st.

*On Admission.*—The paralysis of the extensor muscles was complete, and all the muscles supplied by the musculo-spiral nerve were atrophied. There was also complete anæsthesia over the area supplied by the radial nerve. A mass of callus could be felt on the humerus, about the junction of the middle and lower thirds.

*Operation.*—An incision was made over the course of the nerve above the elbow, and on separating the supinator longus from the brachialis anticus, the musculo-spiral nerve was at once found.

This was then traced upwards, and it soon entered a mass of callus. This was carefully gouged away, and the nerve was followed through it, and after proceeding a short distance it abruptly terminated. The incision was then prolonged upwards, and the upper portion of the nerve was found in its normal situation between the triceps and the humerus, and this was then traced downwards. It passed into the callus, which was gouged away from it, and again an abrupt ending was reached. Careful inspection, however, showed that there was a strand of the nerve sheath left, and on following this slender guide the distal divided end was reached. The bed of bone on which the nerve rested was then gouged smooth, and the question arose as to the best means of dealing with the two ends, which were nearly an inch apart.

By stretching no appreciable approximation could be obtained, so direct suture seemed impossible without excision of an inch of the humerus. The upper end of the nerve was, however, thick and somewhat bulbous, so I turned down a flap from it consisting of half the thickness of the nerve, commencing about an inch from the divided end. This flap when turned down was readily approximated to the distal end, to which it was carefully sutured with fine catgut. The muscles were then sutured over the nerve and the wound was closed.

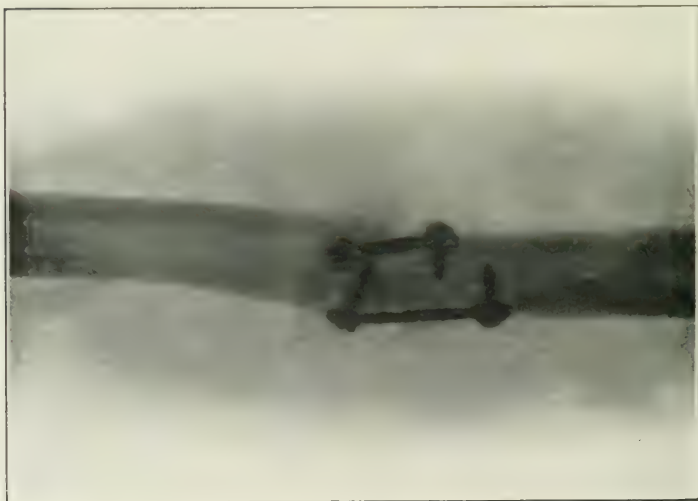
*Progress.*—The wound healed by first intention, and the patient was discharged from the infirmary on December 22nd, wearing a splint which kept the hand in a hyperextended



PLATE XII.



*Shows the hand extended on the forearm, and the scar of the operation wound. (It would have been better if the photographer had taken the hand more in profile, but he was too anxious to show the scar.)*



*Shows the humerus united by Lane's plates. The callus is partly seen, but the bulk of it is behind the bone where it formed an accessory splint.*



position, and he was instructed to attend regularly for massage and electrical treatment.

This he continued to do for some months, and Mr. Jennison, the electrician to the infirmary, took a great interest in the case and attended to him most conscientiously, with the happiest result, although it was some six months before any manifest improvement took place. Recovery of sensation was the first sign of improvement.

A point of importance, insisted on by Tubby, in the treatment was that the patient constantly wore the splint, keeping the hand hyperextended, this being only removed for the massage and galvanism.

After a year's treatment his condition was most satisfactory, sensation was restored, and he could extend the hand and fingers fully. He then left the city, and I lost sight of him, but on April 16th, 1909, he was good enough to come from Barnsley to show his arm at a meeting of the Branch of the British Medical Association, so I had an opportunity of noting the ultimate result.

*Condition Two Years and Four Months after Operation.*—For all practical purposes the functions of the right hand are as good as the left, and only by careful testing is any difference made perceptible.

Sensation is good all over the radial area, but on examining with the heads of two pins held apart at different distances a slight impairment on the injured side was noticed.

The patient's muscular power was remarkably good, he could fully extend the wrist and fingers, and could raise a weight of five pounds placed on the back of the right hand, the injured side, while he could lift six pounds with the left hand.

The photograph shows the hand fully extended, and the scar of the operation wound. (*See Plate XII.*)

#### A CASE OF INJURY TO THE MUSCULO-SPIRAL NERVE.

An Italian seaman, aged 20, was admitted into the Hull Royal Infirmary on April 8th, 1909.

Some five months before admission he had sustained a fracture of the left humerus which was set in splints, and when these were removed it was found that he had wrist drop and an absence of sensation over the distribution of the radial nerve.

As he was unable to speak English, it was difficult to get to

know whether the paralysis was noted immediately after the injury, or only when the splints were taken off. The latter seems the more probable.

*Operation.*—On April 10th, after an X-ray photograph had been taken which showed a mass of callus, an incision was made over the nerve, a tourniquet having been applied so that the dissection would be unimpeded by hæmorrhage. The lower portion of the nerve was easily found between the supinator longus and the brachialis anticus, and was carefully followed up to the site of the fracture. When this was reached, the nerve, instead of pursuing its normal course to the outer side of the bone, turned abruptly inwards and forwards, crossing the humerus in front.

On reaching the inner margin of the humerus it dipped into the callus, and was followed, by careful dissection with the chisel, directly backwards, until it was seen to turn outwards again at the back of the bone.

I then, as in the former case, attacked the problem from the upper end, finding the nerve in its normal situation between the triceps and the humerus, when it was traced down to the site of the fracture where it turned inwards behind the bone.

The exact nature of the injury was now apparent; the nerve had been driven between the fragments, and these had united, having the nerve twisted round the bone. (Fig. 1.)

It was clear then that the only way to replace it was to divide the humerus. This was done with a chisel at the site of the fracture, and on searching behind the upper fragment the nerve was traced and dissected out. It was, of course, greatly stretched, and the wonder is that it was not completely torn through. It was drawn through the divided ends of the bone, and placed in its normal situation.

The bone was then united by means of Lane's plates and screws, a long one being fixed on the anterior aspect and a shorter one on the outer aspect of the bone, while on the inner side the callus formed a capital splint. Apposition of the bony fragments was perfect. (Fig. 2.)

As it was found that the loose nerve now lay over the lower screw of the outer plate, I sutured the biceps to the aponeurosis beneath the nerve so as to protect it from pressure on the screw.

The wound was then irrigated, the tourniquet was removed,

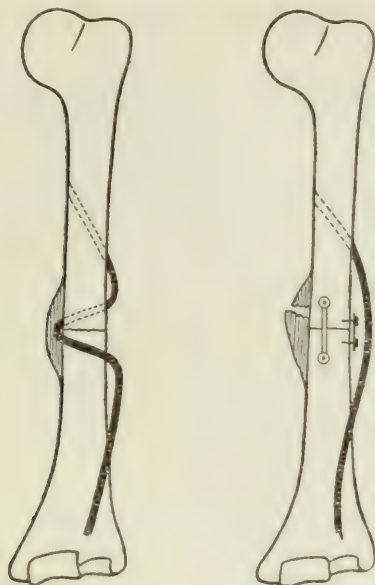


Fig. 1.

Fig. 2.

*Fig. 1 shows the position of the nerve as found at the operation. Fig. 2 shows the nerve replaced after section of the humerus, and the position of Lane's plates.*

and there was practically no hæmorrhage, and the skin was closed.

The whole operation, which was of necessity tedious, lasted two hours. An inside angular splint was applied, and the hand was placed in the hyperextended position.

*Progress.*—There was a little superficial suppuration, so that the wound did not heal by first intention. This was, I think, owing to the tourniquet not having been fixed at first sufficiently tightly, and in order to readjust this the towels had to be lifted, and so infection may have taken place.

On May 6, an X-ray photograph (*see* Plate XII.) was taken, and the patient was about to be discharged from the infirmary.

On July 28th the following note was made:—"He has had continuous daily massage and electrical treatment with most encouraging results. He can now extend the hand to an angle of  $150^{\circ}$  with the forearm, and this against slight opposition. He can extend the two terminal digits of all the fingers, but cannot bring the extended fingers quite into a line with the metacarpus. He is, however, improving rapidly, and if he can continue the treatment the result promises to be most satisfactory."



## MUCOUS COLITIS CONSIDERED AS A NERVOUS DISEASE, WITH SPECIAL REFERENCE TO TREATMENT.

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IN THE PRACTITIONER<sup>1</sup> of July, 1909, Dr. Goodhart says of mucous colitis: "I cannot deal with this complaint here, but I may say this of it, that it is an exceedingly common complaint, and that I believe no one can study it without coming to the conclusion that it is more of the nature of an abdominal neurosis than it is of any real disease of the mucous membrane of the bowel." This *dictum* of Dr. Goodhart's appears to me to be eminently sound; but it must be remembered that the complaint referred to is not, strictly speaking, an *itis* at all—it should more properly be called, "colica mucosa," as suggested by Von Noorden.<sup>2</sup> There are, of course, various organic colon diseases which are accompanied by the passage of loose, mucoid stools. The disease known to British medicine as "mucous colitis" constitutes, however, a distinct morbid entity, and is undoubtedly of neurotic origin. Just as is the case with the uric acid diathesis, the nervous factor in the production of this form of chronic diarrhœa is not yet accorded full recognition, and unfortunate sufferers are still dieted, starved, and clystered even more ruthlessly than the unlucky victims of gout.

The special features which lead us to classify mucous colitis as a neurosis may be epitomized as follows: the subjects of the complaint are generally of a neurotic type, and often present the general symptoms of neurasthenia; it is commonest amongst brain-workers, but no rank or class is exempt; men suffer no less frequently than women. Three factors seem to conduce to its appearance—a "nervous" temperament, chronic constipation (itself a neurosis, at least in its early stages), and a period of prolonged mental stress. Once established, mucous colitis shows all the peculiarities of a functional nervous derangement. It pursues its course irrespectively of what food is taken; I have seen a man who had lived on milk and soda for a week, still passing mucus every

hour. It varies with the general health, lying almost dormant when the bodily tone is good, to break out with renewed fury at the first sign of physical or mental depression. A too prolonged walk, a letter containing bad news, a narrow escape from danger, may each and all prove the determining factor in an attack. The effect of the mind is likewise seen in this fact—that so long as patients are in their own homes, when a sudden call to stool is of no particular consequence, they are fairly free; but as soon as they leave their base, they begin to suffer agonies of apprehension, a mental attitude which frequently brings about the very condition they fear. In its scorn of dieting, its resistance to all locally-acting drugs, its failure to produce permanent physical signs, the disease proclaims aloud its functional nature. That final court of appeal, the post-mortem room, is, fortunately, never reached through the agency of this complaint; but in at least some of the cases of chronic mucoid diarrhœa which have come to necropsy from other causes no lesion of any kind has been discovered.<sup>3</sup> Persistent looseness may be the result of any one of many causes; the fact that some forms of it are without ascertainable organic basis is all important.

In regard to diagnosis, the pitfalls are numerous, and the results of a mistaken opinion are frequently grave. No pains should be spared to distinguish between functional derangement and organic disease. The fæces in mucous colitis present an extraordinary variety of forms—varying from constipated motions streaked with inspissated mucus to fluid stools containing jelly-like masses of the same substance. Or the mucus may take the form of tough rolls or pellets, the passage of which is accompanied by severe pain. Such mucoid pellets are often thought by the patient to be intestinal parasites, and cause great alarm.

The occurrence of occasional attacks resembling mild appendicitis is not to be regarded as necessarily indicating organic disease. Acute pain in the right iliac region with some rise of temperature is frequently caused simply by retention of fæces in the cæcum, and rapidly subsides after free evacuation of the bowels.

Where any doubt remains after an ordinary physical examination of the abdomen, the fæces should be searched for blood, parasites, or fragments of undigested food. In

patients approaching middle life a rectal examination should never be omitted.

So much for the difficulties. On the other hand, most chronic mucoid diarrhoeas of nervous origin are readily enough placed in their true category.

Mucous colitis is a disease characterised by long periods of latency, or semi-latency, during which the bowel condition is productive of a certain amount of pain and discomfort, but is not sufficiently aggressive to interfere seriously with ordinary avocations. From time to time this period of comparative calm is disturbed by acute exacerbations, which prostrate the patient completely for the time being, and vary in their duration from hours to days. Therapeutic measures may therefore be considered (*a*) with a view to giving temporary relief, and (*b*) with the object of benefiting the general condition.

(*a*) Treatment for temporary relief of the acute attacks.—The pain is apparently due to intestinal spasm. The large bowel may often be felt as a hard ribbon, especially in the left iliac region; softening occurs under manipulation. Whether this spasm is the result of ordinary contraction of the gut-fibres, or, according to the ingenious theory of Dr. Stacey Wilson,<sup>1</sup> to abnormal lengthening, morphine appears to be the only drug which will control it. Belladonna, so far as my experience goes, is of no avail, either in large doses or in small. Morphia should not be resorted to until the motions cease to have a fæcal colour and odour; only when pure mucus begins to be passed should it be exhibited. It is best given in the form of a suppository ( $\frac{1}{4}$  grain). The application of heat to the abdomen is grateful. Rest is important, but need not as a rule be long-continued—a few hours are usually sufficient. A milk diet is indicated, but a return to ordinary food should be made as early as possible. Patients recover with phenomenal rapidity; if properly treated, they should seldom be off work more than a day or two.

(*b*) Treatment of the general condition.—First, the patient should understand his own case. He must be relieved from the haunting fear that he is the victim of serious organic disease; must be helped to recognise that, although his troubles are the result of an inborn nervous defect, they



are nevertheless compatible with a long and useful life. Moreover, the obsession—which almost always possesses these patients, as it does the subjects of gout—that salvation lies in diet, must be banished from his mind.

Wholesome ordinary meals are all that are required. Professor von Noorden believes in a largely vegetable diet—spinach, potatoes, brown bread, etc. He claims that the bolus so formed sweeps away the mucus from the intestinal walls, thus preventing its accumulation and spasmodic ejection.<sup>2</sup> Inasmuch, however, as he treats his patients in a special home, where the general hygiene is of the best, one is inclined to think that this may have as much to do with his undoubted success as the special diet. The main thing is to avoid overloading. The food should be neither too hot nor too cold. Red wines and fruit of an acid nature should be forbidden as tending to set up undue gastric peristalsis.

There is no medicine which will cure the disease. All locally acting remedies,—bismuth, preparations of tannic acid, lead, nitrate of silver, intestinal antiseptics, digestive ferments, such as taka-diastase,—have, in my hands, proved useless “Escalin” (aluminium-glycerine paste) is no better here than the older remedies.<sup>3</sup> Colon lavage is equally unavailing. Tonics might seem to be indicated, but strychnine, the tonic *par excellence*, does not appear to be well tolerated, perhaps because it increases reflex nervous irritability.

To put the matter shortly, the drug treatment during the subacute (predominant) phase resolves itself largely into that of the associated constipation. A motion every day should be the ideal aimed at, and enemata should be alternated with medicine by the mouth. Violent purgation is to be avoided. The penalty for two or three days’ neglect is generally a vicious outbreak of diarrhœa. Cod-liver oil, when the stomach will tolerate it, is useful as a food, and also as tending to keep the motions soft. Iron is often of value to females, in whom also any associated pelvic trouble should be appropriately treated.

Opium is a great aid to patients compelled to take part in business or social affairs. From 10 to 30 minims of the tincture taken before, let us say, a public meeting will give immunity for some hours. The drug should be dispensed by

the doctor, its taste concealed, and any signs of commencing habit carefully watched for. Unless in special cases, it is desirable to keep the patient in ignorance of what he is getting.

The procedure known as appendicostomy—performed with a view to securing thorough irrigation of the colon—I consider unjustifiable. Relapse is almost constant, and equal temporary improvement can be secured by other measures. I have elsewhere<sup>6</sup> urged the necessity for operation in persistent diarrhœa obviously due to colon ulceration; I now emphasise the converse.

Like Dr. Goodhart's advice to the gouty, our words or wisdom to sufferers from mucous colitis will vary with each individual. With some, monotony must be varied; with others, excitements curtailed. Moderate exercise is good; horse-riding and golf are splendid tonics. A change of place and associations is often beneficial, but care must be taken not to send the patient where urgent calls to stool might cause him social embarrassment. Finally, the application of massage and faradism over the bowel area, and the practice of cold douching and abdominal gymnastics by the patient himself, may be counted on to produce marked improvement.

In regard to prognosis, what are we to tell the patient? Cure is rare; amelioration, the rule. A slight tendency towards mucoid diarrhœa, alternating with periods of sluggishness, will probably persist through life; but the sufferer from mucous colitis may be confidently assured that his disease need not prove a serious handicap either in business or pleasure.

Once convinced that you are dealing not with an organic disease, but with an abdominal neurosis, treat the patient, and the bowels will take care of themselves.

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- <sup>4</sup> "Pain in Irritable States of the Colon," *B.M.J.*, 1909.
- <sup>5</sup> "The Use of *Escalin* in Gastro-Intestinal Disorder," *Med. Press*, August 11th, 1909.
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## A RHEUMATIC TOXÆMIA.

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THERE is, perhaps, no class of disease in which differentiation of type is more important than in that designated generally as rheumatism. The differential diagnosis of the acute rheumatoid affections from the acute rheumatic, for instance, is a matter not of clinical interest only, but of vital importance to success in treatment.

The condition to which I wish to draw attention is not one of the recognised types of rheumatism, but a state which is closely allied to them by reason of the fact that one of its phases is the onset of acute joint trouble, and furthermore by the circumstance that it is often the forerunner of one or other of the more severe forms of that class of disorder. Probably most or all of the rheumatic and rheumatoid diseases are the result of toxæmic poisoning, but the condition which I am now dealing with is a distinct clinical entity, and its true recognition may be the means of preventing both the attacks of the joints which are one of its symptoms, and the onset of more severe and permanent forms of disease, and also of improving vastly the general health and welfare of the patient. The condition is more easily described than defined. Patients of this type are usually sallow, dyspeptic, irritable, and easily tired, and frequently complain of pains or uneasiness in the muscular structures, especially in the neighbourhood of the joints, while it only needs a continuation of adverse circumstances, such as undue fatigue or exposure to cold, worry, or overwork, to precipitate an acute attack of joint trouble closely resembling rheumatic fever, but, as I shall attempt to show, essentially different from it, both in its intrinsic nature and in regard to progress and treatment.

In order to understand the natural history of this condition it is necessary to consider it in three stages: (1) Within the alimentary tract. (2) In the general circulation. (3) In the joints.

First stage. *Within the alimentary tract.*—Those who suffer



from this condition are frequently troubled with nausea and other dyspeptic symptoms, but not with bilious attacks. If they were only fortunate enough to have the latter, much of their trouble would cease, as their digestions would get a rest now and then, which is more important in their case than in other persons, as, owing to their habitual sense of tiredness and depression, these patients are often in the habit of taking more food (and taking it more frequently too) than they can assimilate or get rid of.

The primary fault is, I believe, in the deficient power of digesting starchy foods owing to the acid or comparatively acid condition of the saliva, which, in its turn, is still further aggravated by the condition of the stomach. It is true that the proteid digestion may also be at fault, but this is probably only because it is interfered with by the accumulation of undigested carbohydrate matter in the stomach. I remember once seeing a patient of this type who had got into such a miserable state from nausea, due to his having taken a preponderance of starchy matter in his diet, because "meat was bad for rheumatism," that he could scarcely even look at food. In his case a meal consisting of a pint of hot tea followed in half an hour by a lean chop with dry toast, was not only digested easily, but made a new man of him for the time being. If the patient puts himself under treatment at this stage, the condition is, as a rule, easily remedied by the use of alkalis—at least 60 to 90 grains of sod. bicarb. each day, aperients of effervescing sulphate of soda, and a diet in which the starchy elements are limited to the dry form, as toast and biscuits, and by the use of malt extract with meals. Home-made cake, if it is not moist or doughy, will generally be found to be harmless, while sugar is not only innocuous but, in my opinion, is, within reasonable limits, an aid to digestion.

Second stage. *In the general circulation.*—The headache, languor, nervous irritability, and sleeplessness, and the vague pains from which these patients suffer, are the results of imperfect metabolism, on the top of the digestive troubles. Such patients, on account of their being easily tired, usually shirk exercise. In this they are abetted by their friends, who press them to take plenty of rest, and, as the patient is generally fed up at the same time, and is probably also

taking a "good tonic," the results are usually somewhat disastrous.

The remedy is threefold: (*a*) limit the intake; (*b*) increase the combustion; and (*c*) aid excretion.

(*a*) As to the intake, it will nearly always be found that the patient is consuming a quantity of food considerably in excess of his needs. The same remark, of course, applies to the vast majority of persons; but in many of them the evil day is postponed owing to counterbalancing influences, such as incidental illnesses, or bilious attacks, necessitating dietetic rest, or because they take sufficient exercise to work it off. In the case of patients such as we are now dealing with, the amount of food is often not only in excess of their requirements, but is also a strain on digestion and assimilation such as the system is unable to withstand. As I have said already, these patients are usually of the thin type and much of their trouble arises from attempts to fatten them. There is a rule, and the only safe one in dealing with rheumatic people of this class, not sufficiently recognised, viz., that a man may be thin and yet be too fat. That a patient is below the average weight of his fellows is no indication for trying to increase his weight. I know one patient of this type who weighed 9 stones and had spent years in trying to raise it to ten, with the result that he not only failed in his object, but suffered from the whole catalogue of symptoms such as I have already described. At last, when put on a diet excluding potatoes, and bread and milk puddings, he lost half a stone in weight and enjoyed a measure of health, and freedom from his aches and pains and gastric troubles, such as he had not known for years. The dictum in such cases is, "If fat, make thin; if thin, make thinner." To attempt to fatten them is about as logical as putting more coal on a fire which is burning badly.

(*b*) Increase the combustion of the waste products within the system. I am compelled to use this vague term, as our present knowledge does not extend to a more accurate definition or description of this waste matter, although it is probably one of the intermediate stages of uric acid formation. This can only be done by exercise, forced exercise, in fact—by which I mean more than the patient feels inclined for. Such patients are liable to take far too little exercise, as they

are quickly tired owing to the excess of waste matter in the muscles, and must be encouraged to go on walking or bicycling or golfing or doing dumb-bell exercise beyond the stage of fatigue. It will generally be found that a man who complains of fatigue after the first mile of a walk will come back after doing five or six miles refreshed and without a trace of languor. Another practice which should be encouraged is the use of hot baths at least twice a week. The water should be not less than 100° F., and the patient should rub the limbs and body well while under water, and squeeze the muscles also. It will be found the best tonic and refresher for such patients, and is the only tonic which they are capable of taking. An important point to observe in this connection is that the patient should not cool down the water before getting out. If he comes out of the bath with the water not below 100° F. he will avoid all risk of taking cold—in fact he could walk out into the air immediately after drying and dressing himself without any risk, even on the coldest day. In this connection we may mention also the importance of diluent drinks, both after the bath and at all other times also. As a rule these patients take too little liquid, and the use of plenty of hot drinks will be found extremely beneficial. Of all others, perhaps China tea is the best, either with or between meals. It can be taken in any quantity without the ill effects of other forms of tea, and it is an excellent form of drink for flushing the tissues.

(c) Excretion. Most of these patients, like many others of a neurotic type, pride themselves on the regularity of their bowels. It will usually be found on inquiry that the motions, if regular, are regularly inefficient as to quantity. These persons are usually afraid of aperients as being "lowering" and "thinning," and yet a daily pill such as the compound aloin will prove of great service to them. If the tongue is white an occasional dose of calomel, followed by an effervescing saline, has an excellent effect. Their general condition may also be ameliorated by the use of salicylate of soda. The great points about this drug are, I believe, that it is of the greatest service before the onset of joint pains, and, secondly, that it should never be given until the tongue is clean. We often hear of the ill effects of salicylates,—singing in the ears, depressions etc., but if this drug were given only after the tongue has been



got into a healthy state, these untoward effects would be conspicuous by their absence.

Salicylate of soda is of great value in relieving the nervous irritability from which these patients so frequently suffer, while a dose of 20 grains of the drug at bedtime often proves an efficient remedy for sleeplessness. As a matter of fact, however, if the patient has been placed on a suitable diet, and has been made to take exercise and use aperients regularly, so as to get a thoroughly good motion each day, neither salicylate of soda nor aspirin, which is often used in place of it now, will be required, as the symptoms will have abated sufficiently to render these drugs unnecessary. As to aspirin, which I have just mentioned, it is of use in relieving pain, but does not appear to have the excretory value of the salicylates.

Third stage. *In the joints.*—If the individual has been allowed to drift on, it only requires exposure to cold or some other depressing circumstance to precipitate an attack of pain and swelling in the neighbourhood of a joint or joints, and so to bring us to the third stage of which I have spoken. It is of great importance, both from the point of view of prognosis and from that of treatment, to differentiate these attacks from those of rheumatic fever, as we commonly understand it. These attacks are the finale of a series of digestive and general disturbances, in marked contrast to rheumatic fever, which, in my experience at least, often comes (in the same way as pneumonia or influenza) like a bolt from the blue, in persons of an otherwise healthy and robust type. In fact, the worst cases of rheumatic fever are to be found in young persons of what used to be called the sanguine temperament—clear eyed, clear skinned, and full of life and energy. In the attacks we are now discussing, it is rarely that more than one or two joints are affected, and careful observation will generally reveal the fact that the swelling is chiefly in the ligaments and tendon sheaths around the joint, and not in the joint itself. The duration of these attacks under appropriate treatment is generally short, and appears to be proportionate to the primary dose of toxic material.

Put the patient on a fluid diet, chiefly milk, keep him in bed, give large doses of bicarbonate of soda, with aperients, calomel if the tongue is white, liquorice powder if it is brown

with salicylates after the tongue has become clean, and in a few days the matter is usually at an end.

Compare this with rheumatic fever, where, in spite of the most careful treatment, it is often found that one joint after another becomes affected, with prostration out of all proportion to the disease, and a marked tendency to heart affections, and a long protracted series of relapses, all suggesting the presence of some bacterial agency. In fact the one class of case reminds us of a sapræmia, the other of a septicæmia, the former yielding readily to simple treatment such as I have described, the other frequently baffling all methods of treatment as yet, but which it is to be hoped may at no distant period be overcome by the use of an appropriate antitoxin.

This concludes the third stage of this morbid condition, which I have termed, for want of a better name, a rheumatic toxæmia. The point I wish to emphasise is that the recognition of this malady in its early stages may be the means, not only of preventing the acute joint attacks, but also of vastly improving the general health of the patient and increasing his sense of well-being, thus making him a more useful member of society. It may, however, even be that in preventing these acute attacks we are saving him from falling a victim to one or other of the more serious forms of rheumatism; for it is feasible to suppose that they must, by the repeated irritation of the joint structures, predispose to the onset of severe and permanent forms of disease, especially when we consider that the constant state of toxic poisoning from which the whole system suffers presents many points of analogy to that of rheumatoid disease. Another thing I wish to emphasise is that the whole treatment of this condition can be carried out without having to send the patient from home. The various points of treatment—alkalies, and Maltine, to correct the alimentary disturbances; exercise and Turkish baths, with diluent drinks such as hot lemon water or weak tea, to improve the metabolism; and salicylates and aspirin to correct the poison, whatever it may be,—these can be obtained and used at home as well as at the most fashionable watering-place, and with much saving of time and expense to those concerned.

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SOME RECENT LITERATURE ON DISEASES OF  
THE NERVOUS SYSTEM.

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## ACROMEGALY.

SINCE acromegaly was first described by Pierre Marie, its mode of origin has been much discussed, for although it is frequently closely associated with disease of the pituitary gland, the exact connection between the two still remains a matter for debate.

The results of recent investigations all go towards showing that a far closer relationship than was previously suspected exists between the different "ductless" glands, and further that there is a particularly strong relationship between the pituitary and the thyroid glands. An interesting paper dealing with acromegaly has lately been written by Giuseppe Franchini and G. J. Giglioli. (*Nouvelle Iconographie de la Salpitricre*, 1908.) In it comments are based upon the symptoms of three cases in which some of the more remarkable points to be noted were—(1) Hereditary tendency; (2) asymmetry of the enlargement; and (3) absence in two cases of ocular symptoms which are so frequently associated with alterations in size of the pituitary body. That the condition of acromegaly may be handed down from parent to child is an important fact which at once necessitates a wider explanation of the disease being given than that of mere accidental enlargement of the pituitary gland, as, besides their own case, the authors just mentioned have found records of at least five others of a similar nature.

Stress is also laid on the frequency with which symptoms of exophthalmic goitre and myxœdema may accompany those of acromegaly. In this connection I have recently mentioned an interesting example of the co-existence of acromegaly and myxœdema in which the symptoms almost entirely disappeared while the patient was taking thyroid gland. In this instance failure of sight was the first symptom complained of, and the patient was found to have bitemporal hemianopia, which is in itself suggestive of pituitary enlargement, since this gland, from



its position, is the structure by far most likely to press on the chiasma at the point where the fibres decussate. There was also enlargement of the face, especially of the lower jaw, and of the hands, all pointing to the same conclusion; but there was withal a puffiness and thickening of the skin which forcibly reminded one of myxœdema, which for the most part disappeared when thyroid was given. I have no doubt that this was an example of the intimate correlation that may exist between the thyroid and the pituitary glands. And it has been shown that in some animals at any rate removal of the thyroid gland is followed by an enlargement of the pituitary body, together with an alteration in the quality of its secretion.

It is probably not going too far to say that acromegaly is closely associated with changes in one or more of the ductless glands of which that of the pituitary body is generally the most prominent, but up to the present nothing further can be said with certainty.

Regarding the subject from its therapeutical aspect it certainly seems advisable, at any rate in cases where the disease has not made much progress, to try the effects of preparations of the various internal secretions, and of the thyroid gland in particular.

#### OPERATIONS UPON THE PITUITARY BODY.

As of late years it has been found possible to operate upon the pituitary body, it has become important to know whether this gland is essential to the maintenance of life, and this question is considered by Dr. Lewis L. Reford and Dr. Harvey Cushing in the *Johns Hopkins Hospital Bulletin* of April, 1909. These authors allude to the operations of Paulesco in the records of which it is stated that the total extirpation of the gland is incompatible with life, and their aim is to test the truth of this assertion.

Though less active and responsive than after other operations, animals in which the pituitary body had been removed for a day or so appeared to behave in the natural way, and in an average case the temperature, pulse, and respiration were practically normal. After some hours, however, usually before the second day, and occasionally even from the time of the operation, the animals became lethargic and gradually passed into a comatose condition with feeble pulse and often

subnormal temperature. The subcutaneous injection of an infusion of recently removed pituitary body produced no good effects, and after death there was no special change found. These authors conclude that the results of their observations support Paulesco's view, that life is impossible after the pituitary body has been totally removed, and they infer that the surgery of this gland must be limited to the removal of tumours connected with it, or in the case of hypertrophy with the partial removal of the gland.

While on the subject of the internal secretions, allusion may be made to Dr. Leonard Williams's observations on the use of the "Thyroid Gland in the Treatment of Nocturnal Enuresis," *Lancet*, May 1, 1909. Dr. Leonard Williams's attention was first drawn to this matter by the urgent necessity of effecting a cure in the case of a boy who was debarred by his infirmity from attending his school. Adenoids being present, and being currently supposed to be one of the causes of enuresis, they were removed, with the unfortunate result that the enuresis became even more frequent than it had hitherto been. A consideration of all the circumstances of the case led to the idea that the removal of the adenoids might possibly have deprived the patient of some internal secretion which had up to that time acted as a partial protection against the accidents, and acting on this hypothesis Dr. Williams determined to try the effect of thyroid extract. One of Burroughs Wellcome & Co's half-grain tabloids was taken night and morning with the satisfactory result that the enuresis immediately ceased, and under the continued influence of the gland it has not recurred.

After such a good result, Dr. Williams consulted the literature of the subject and found a paper by Dr. Hertoghe, in which mention is made of the curative effects of thyroid gland in this class of case, and on this Dr. Williams has given the method a more extensive trial, with good effects in a large number of cases. The dose of the thyroid appears to be a most important matter, and Dr. Williams finds from his experience that the initial dose should be very small, and that it should be increased very cautiously, if at all.

#### THE THERAPEUTIC VALUE OF UROTROPIN IN MENINGITIS.

Dr. S. J. Crowe in the *Johns Hopkins Hospital Bulletin* of April, 1909, contributes an important article on this subject.

Acting on the suggestion that urotropin might be excreted through the cerebro-spinal fluid, as well as through the bile and pancreatic juice, the fluid of a boy, who was afflicted with a cerebro-spinal fistula, was tested a few hours after 10 grs. of urotropin had been given by the mouth, and chemical tests showed that the drug was present in considerable quantity. The dose was accordingly increased to 30 grs. a day diluted with large quantities of water, and after a week the temperature slowly fell, and the cerebro-spinal fluid, escaping through the fistula which had previously been purulent, gradually lost this character and became less in quantity, and three weeks after the drug was first given the temperature was normal and the fistula was closed.

Further observation showed that urotropin after being taken by the mouth can invariably be found in the cerebro-spinal fluid. In order to find out if the urotropin appearing in the cerebro-spinal fluid had any bactericidal action, observations were made to show its effect on the growth of organisms inoculated in the fluid after its removal from the body.

The author concludes (1) that urotropin when given by the mouth invariably appears in the cerebro-spinal fluid.

(2) The largest amount of urotropin is present in the cerebro-spinal fluid from 30 to 60 minutes after the drug has been given.

(3) After doses of urotropin within therapeutic limits a sufficient amount of the drug appears in the cerebro-spinal fluid to exercise a decided inhibitory effect on the growth of organisms inoculated into this fluid after its removal from the body.

(4) Following a subdural inoculation of dogs and rabbits with streptococcus, 60 to 80 grs. a day, given under conditions to ensure absorption, will markedly defer, and in some cases prevent, the onset of a fatal meningitis.

(5) In view of these observations the prompt administration of urotropin is advised in all clinical cases in which meningitis is a possible or threatened complication, or even when meningeal infection has actually occurred.

#### CEREBRAL CENTRES FOR TASTE AND SMELL.

Dr. Charles K. Mills (*Journal of American Medical Association*, September 12, 1908) has written an interesting paper



dealing with the cerebral centres of taste and smell, and has illustrated it by a case of cerebral tumour which came under his observation.

The importance of connecting sensations of smell and taste with lesions of the uncinate convolution was first pointed out by Dr. Hughlings Jackson, who showed that these sensations are often accompanied by movements of the lips and of the jaw, as though the patient were eating or swallowing something, and also with a peculiar mental condition known as the dreamy state, this combination of symptoms being the result of a discharge from the cortex of the uncinate convolution, or its immediate neighbourhood. The symptoms are to be found in connection with epileptic fits, which originate in this part of the brain. The occurrence, therefore, of these peculiar sensations indicates in the first place that a discharge is taking place from the uncinate region. The cause of the discharge, whether due to epilepsy, tumour, or some other form of irritation, has then to be considered.

Mills lays stress on the desirability of paying special attention to the respiratory functions in this class of case. In the case of a patient whose history he records, some peculiarities of respiration were noted during the attacks, and the patient's appearance indicated the presence of slight asphyxia or interference with the respiration and cardiac action. In a severe attack the face became pale and then congested. This observation is in keeping with those of Dr. Hughlings Jackson, in which he called attention to the signs of asphyxia which may be noted in seizures of this kind, and he also suggested that the cause of it might be due to the discharge spreading to the cortical centres dealing with respiration. These centres were investigated by Spencer, who found that respiration can be arrested by the stimulation of an area of the cortex situated just in front of the junction of the olfactory tract with the uncinate.

Mills considers that there is still room for further observations in connection with the localisation of functions in the inferior portion of the temporal lobe and the orbital surface of the frontal lobe, and that at present the indications are in favour not only of the location in the uncinate region of the centres for smell and taste, but also for the representation in this region and its vicinity of the sensations produced by the

activities of the abdominal and thoracic viscera.

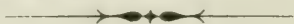
#### FACIAL PARALYSIS.

In a paper on facial paralysis (*Journal of Nervous and Mental Disease*, Feb. 1909), Dr. G. A. Waterman makes a study of 335 cases with a view to determining—(1) whether those in which a complete reaction of degeneration was found made a more rapid or perfect recovery; (2) whether exposure is an important factor in ætiology; (3) whether the attacks occur with much greater frequency in the winter months; (4) is the paralysis more severe in the elderly than in the young or middle-aged? (5) does continued galvanic treatment play any part in the predisposition to secondary contraction? and (6) whether the initial pain is of any prognostic value as regards the severity of the attack.

Whether the neuritis is a primary one or is secondary to the inflammation of the middle ear, Waterman considers that there can be no doubt that exposure to cold winds or draughts plays a part in the causation of the attack, and that the history of direct exposure to cold is obtained too often to be a coincidence. He points out, however, that if a cold were a primary cause, we should find facial paralysis more frequent in winter, and though some authors state that this is the case Waterman's figures appear to show that the average of the different months seems to be almost uniform, and he concludes that though exposure may precipitate an attack the real cause lies in the lessened power of resistance of the individual.

With regard to the influence of pain on the prognosis Waterman finds that it has been, in his experience, common to find severe pain in the ear or mastoid region followed by a mild attack of facial paralysis, and on the whole the pain felt by those afflicted with a milder attack has seemed quite as bad as that met with in more severe cases.

With regard to the influence of galvanism on subsequent contracture, he concludes, from a careful comparison of statistics, that the administration of galvanism plays no part in causation of this condition, and he discusses at some length the question as to whether the secondary contracture is due primarily to a change in the muscle or the nerve.



## MODERN ASSISTANCY.

By ALBERT SHEPPERD, L.S.A.,

*Late Deputy House Surgeon, Coventry and Warwickshire Hospital and  
Northampton General Hospital.*

THIRTY years ago the average medical man took an assistantcy directly he was qualified.

Nowadays the growth of special and general hospitals has so increased the number of vacancies for resident medical officers that most recently qualified men take these posts, and are, therefore, not available for assistantcy work. Everybody admits that the knowledge acquired as resident medical officer of an hospital is most valuable ; so is the experience gained as an assistant in a large private practice, and it is an unfortunate fact that this is not so readily admitted.

As an ex-acting house-surgeon of two county hospitals, and as an old assistant also, perhaps I may be permitted to enlarge a little upon the advantages and disadvantages of an assistant's position, and to point out, so far as I am able, wherein the experience thus gained differs from that obtained in an hospital or similar institution.

It is impossible to deny that there is much to dislike in the position of assistant.

The practice is usually amongst the working classes. The assistant has to attend most of the midwifery cases, and to take the night calls. Many of the patients resent being visited by the assistant at first. They have no personal objection to him in most cases, but they feel injured because "the doctor, himself," has not come, and they give expression to this feeling with a candour that is most exasperating to a sensitive man. The difficulty, however, will be got over in time if the assistant has tact, and hides his annoyance. It is well to remember that uneducated persons show their feelings without reserve, and often have no desire to give offence, and no knowledge of



having done so.

The night work is very arduous at times, and constitutes the most valid objection to the position. It must be submitted to as a means to an end, for the experience thus acquired of midwifery and other emergency cases will prove of incalculable value to any young medical man, and will materially add to the success of his career. The difference in the experience gained in hospital and as assistant is very well exemplified in the night work.

House-surgeons in hospital work have all the means and appliances to their hand that money can buy or ingenuity suggest. To be able to operate in a good light ; to have all the proper instruments available ; to be assisted by highly-trained nurses, and to have some of the most able members of the profession within call at the end of a telephone,—all these advantages are taken as a matter of course by the average resident medical officer.

He does not always realise how conducive they are to good work on his part. The same man will probably be in general practice on his own account some day. Give him a similar case to the one he treated so ably in the hospital, and see how infinitely harder he will find his work has become. No help within a mile or two ; no assistance worthy of the name ; a bad light, and a crowd of anxious relatives offering unnecessary advice and futile criticism. Add to this the fact that probably very few of the requisite appliances are at hand, and that the practitioner must tax his resources to the utmost to make efficient use of the crude materials at his command.

Few men whose previous experience has been confined to hospital work could be expected to shine in such conditions. Nearly all who have held an assistantcy have met with such cases, and are therefore more likely to acquit themselves creditably when confronted with similar situations in their own practice. It is impossible to emphasise this point too strongly.

In hospital work one has help at hand, and in private practice one has very often to work alone, and it is this feeling of isolation which is found most oppressive to a man who has

passed directly from an hospital appointment to a private practice of his own. Here, then, is one very distinct advantage for the man who has been "through the mill" as an assistant.

The hospital man has very hazy ideas, as a rule, about economical dispensing. He can write a good prescription, no doubt, but has no notion of prices, and uses expensive proprietary articles in many cases where an efficient substitute can be supplied at a fraction of the cost. The man who has acted as an assistant will have mastered these rudiments, and consequently may save some pounds on his annual drugs, because he has learned to realise that "a rose by any other name will smell as sweet."

To be successful as an assistant it is necessary to learn how to adapt oneself readily to altered conditions and surroundings. To live in another man's house and manage never to be in the way, and yet never out of it when required; to obtain the greatest amount of pleasure and practical experience for oneself, and to give the best possible measure of satisfaction to one's chief,—these things need tact and the art of adaptability to environment. This art, having been practised as assistant, is of no small help to a man when he takes a practice for himself, and realises that the general practitioner must understand mankind if he would treat their diseases.

These are a few of the advantages gained by the assistant, and it does not seem possible to obtain them in any other way. I would say to the man who intends to start his career as an assistant: "Choose a nice practice if you can, and a pleasant neighbourhood if possible." It is more agreeable to be in a comfortable house than in a poor one, and a peaceful home is more precious than rubies.

All these things deserve to be considered, but the one great essential is the nature of the man under whom you propose to work. Choose your future "chief" with the greatest possible care, for upon this will depend in large measure your success or failure as assistant. If he be a man who commands your respect both as doctor and as an individual; if he works himself harder than he works you; if he is ready to give and take, and to make allowances for

youthful inexperience whilst never letting himself be slighted in any way—in short, if he be a gentleman who respects himself and consequently knows how to respect you, all will be well. The assistant who works under such a man—and they are to be found—has chosen wisely. It is convenient to work on probation for a month, when practicable, before signing a regular bond.

The salaries compare favourably with those paid to residents in hospitals, and in many ways the life is a more pleasant and healthy one.

Hospital practice may produce more "good" cases from the academical point of view, but it is the experience gained in a large private practice which will be found most materially to aid the average medical man in his after career. It is in private that one learns to see and to avoid the various little pitfalls which beset the path of the inexperienced G.P., and every one of us quickly learns to appreciate Pope's famous line :—

"The proper study of mankind is man."





## Reviews of Books.

*A Synopsis of Surgery.* By ERNEST W. HEY GROVES, M.S., M.D., B.Sc., F.R.C.S., Assistant Surgeon to the Bristol General Hospital, Surgeon to the Corsham Hospital, Senior Demonstrator of Anatomy at the University College, Bristol. Pp. viii + 486. Bristol: John Wright & Sons, Ltd. 7s. 6d. net.

THE author aims at giving "an epitome of the salient facts in surgical practice" for the use of students in revising the knowledge garnered from the larger works, and also for the busy man in practice, who cannot find time to read the big books, and cannot always put his hand upon a valued article in some weekly or monthly publication. For such purposes, the book is certainly very well adapted. We prefer the big books with marginal annotations, but, as the author remarks with truth, unpalatable as truth so often is, the big book is soon out of date. If the guide, philosopher, and friend of our earlier days is replaced by a new edition, it is no longer in the same country, where every lane, or even by-path, had its well-known landmark, that we travel. Then, again, the replacing of the big book is a costly process. Such a book as this, in which the matter is methodically arranged, and the essentials of diagnosis and treatment are concisely given, may well play the part of an opsonin. It is handy, convenient for reference, and more easily replaceable than the large treatise. The chapters upon the systematic examination of the bones, joints, abdomen, and inguino-scrotal region are well conceived and carried out.

*Treatment of Consumption.* By W. CAMAC WILKINSON, B.A., M.D., F.R.C.P., Lecturer in Medicine, University of Sydney, Honorary Physician, Prince Alfred Hospital, Sydney, etc. Pp. 266. London: Macmillan & Co., Limited. 10s. net.

DR. WILKINSON'S book is a most instructive and useful one, especially in the light of recent knowledge and research in the direction of the subject of the source, spread, and prevention of tuberculosis. The chapter headed "The Problem in the Laboratory" gives an interesting account of some of the work by Professor Robert Koch. Part III. of the book discusses the problem of tuberculosis in man, and man as the most frequent host of the parasite. Towards the end of the book, a number of records of cases treated with tuberculin, with the results obtained, is added, which greatly enhances the clinical value of the book.

*Physiological Principles in Treatment.* By W. LANGDON BROWN, M.D., F.R.C.P., Physician to the Metropolitan Hospital; Medical Registrar and Demonstrator of Physiology, St. Bartholomew's Hospital. Pp. vii + 344. London: Baillière, Tindall & Cox. 5s. net.

THIS little work, as the author explains, is in no way to be considered as a complete treatise upon physiology as applied to medicine. In an admirable way, however, it sets down important physiological principles which may be readily applied to practical medicine. The book is most

interesting reading, and we heartily commend it to the busy practitioner, for in it he will find some important points dealing with the physiology of digestion, the neuro-muscular mechanism of the heart, and the importance of registering the blood-pressure in man.

*The Extra Pharmacopœia of Martindale and Westcott.* Revised by W. HARRISON MARTINDALE, Ph.D., F.C.S., and W. WYNN WESTCOTT, M.B., D.P.H., H.M. Coroner for North-East London. Pp. xl + 1163. London: H. K. Lewis. 10s. 6d. net.

THE book before us is the thirteenth edition which has undergone a thorough revision, many portions having been entirely re-written. Some of the matter has been reset in smaller type, and about 128 pages added, but the volume is somewhat smaller than its immediate predecessor, for a thinner paper has been used. The value of the book to the general practitioner is so great that we believe it to be essential for every one to possess a copy.

*A System of Diet and Dietetics.* Edited by G. A. SUTHERLAND, M.D., F.R.C.P. Pp. xiv + 893. London: Oxford Medical Publications. 30s. net.

IN this large and well-printed volume is admirably presented the reasoned state of opinion, based upon large experience, about the question of dietetics. The matter is very dear to many laymen, and of all bores the most distressing is the food-faddist. He is the natural outcome of the present position of the subject, which has, very largely, an empirical basis. This must continue until the exceedingly complex and difficult questions of metabolism and nutrition can be brought into the full light of day. The contributors to this volume are all men who have had special experience in the subjects on which they write. They set forth, therefore, their own principles and practice, more or less dogmatically, but with due consideration of other views.

We congratulate the Editor on having brought together a noteworthy and valuable addition to medical literature. Here and there a clerical error has escaped revision. The type is admirably suited for easy reading, and the bulky volume is surprisingly light to hold.

*The Law in General Practice, some Chapters in everyday Forensic Medicine*  
By STANLEY B. ATKINSON, M.A., M.B., B.Sc., of the Inner Temple, Barrister-at-Law; Justice of the Peace for the County of London; Member of the Central Midwives' Board; Hon. Secretary of the Medico-Legal Society. Pp. viii and 239. London: Oxford Medical Publications.

THIS is not so much a book on forensic medicine as it is an authoritative guide to the actual legal position in which a qualified man stands in relation to the various responsibilities attaching to his craft. It is a most useful work, for it contains, pithily written in a most readable style, a great deal of information which no general practitioner can afford to be without; information which can in no wise be obtained at the medical schools; but which, not infrequently, at the cost of bitter experience he is forced, more or less painfully, to pick up for himself. The first chapter is on "Practical cautions and precautions," and deals more particularly with a medical man's conduct of his practice, both in its general professional aspect, and on the purely business side. There is much sound advice in it,

and there are also many practical hints of value. The second chapter—an excellent one—is devoted to "Medical evidence and medical witnesses." Here the author's medical and legal training and experience combine to admirable purpose. "Medical certificates and Medical reports" are dealt with in the third chapter. Here again the information given will be found of much value to many now in practice, for it shows how to proceed, with circumspection and due self-regard, in these oft-times troublesome matters.

"The law of defamation, in relation to the medical practitioner," forms the subject of the fourth chapter. In this is naturally included the vexed question of professional privilege. The whole subject is handled with much skill and acumen. Then follows a consideration of the "law on negligence," which important topic is clearly and ably explained. The concluding chapters deal with "Some difficult clinical occasions," such as abortions, anæsthesia, "drunk or dying," and so forth, "Cases arising in the Coroner's Court," including suicide and infanticide, and lastly some useful advice as to the "limitations of medical evidence." A short bibliography, an index to the leading cases quoted, and a general index, which might perhaps be somewhat extended, add to the completeness of a book, which every man in, or about to enter upon, general practice, will find to be of the utmost service to him on many occasions.

*Diseases of the Eye.* By M. STEPHEN MAYOU, F.R.C.S., Assistant Surgeon and Pathologist, Central London Ophthalmic Hospital. Cr. Svo. London: Oxford Medical Publications. 5s.

IN this manual, Mr. Mayou has successfully reviewed the main points in ophthalmic practice, and its perusal is made easier by the 119 illustrations, and eight coloured plates. Although the author has doubtless endeavoured to reduce his résumé to a dead level of excellence, he cannot quite hide either his strength or his weakness.

Thus it is that the pathological teaching is of an unusually high order, not only as a summary of the sequence of a morbid process, but as a light on the less clear path of treatment; while, on the other hand, the section devoted to optics and errors of refraction, contains many inaccurate statements, and is clothed in loose phraseology. Without going into these in detail, we would point out that, in ametropia, we add or subtract one millimetre to the distance of the retina from the nodal point, not "to the length of the image."

Snellen's types do not "subtend an angle of  $5^\circ$ , *i.e.*, about the distance between two cones in the macular region." The visual angle of a letter is 5 minutes, of its limbs, 1 minute; allowing 0.002 mm. as the diameter of a foveal cone, the angle subtended by two contiguous cones, at the posterior nodal point of the eye, is about 27 seconds. However, the rest of the book is so good that one can forgive errors of this sort.





## Notes by the Way.

**Cordial Reception  
of the New  
Professional  
Centre.**

WE have been more than satisfied by the reception accorded to the announcement contained in our October issue. It has never been our practice, indeed, to launch any new scheme without having first convinced ourselves that success was assured; but we must admit that we were not prepared for the spontaneous outburst of enthusiasm aroused by our latest enterprise.

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**Conclusive  
Evidence.**

THE first telegram of congratulation was delivered within three hours of the publication of THE PRACTITIONER; and it proved to be the cheering harbinger of many others. Then letters began to arrive,—not singly, nor in twos and threes, but literally in battalions. There was a stir—we should almost be justified in writing a “furore”—throughout the length and breadth of the United Kingdom: from Cornwall to Caithness, “from Edinburgh to Berwick bounds, from Lynn to Milford Bay,” and even from the wilds of Connemara. The demonstration is conclusive that the centralisation of the activities connected with the business side of the medical profession has not only aroused the liveliest interest, but will meet a want of which the profession has long been keenly conscious.

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The  
Departments.

IN case any subscriber was in too great a hurry to do more than glance cursorily at our last month's "Notes by the Way," we will repeat the list of various Departments therein enumerated. They are seven in number, and are as follows:—

1. The Transfer of Practices.
2. The Negotiation of Partnerships.
3. Medical Accountancy.
4. The Collection of Professional Debts.
5. The Supply of Locum Tenens.
6. A Sale and Exchange.
7. The Advising upon, and Effecting of, every kind of Insurance.

All these departments will be in full working order on and after the 1st of January next; and a pamphlet giving full details is in preparation, and will be issued in the course of the month of December. We would ask subscribers to exercise a little patience, and not to apply, as many have already begun to do, before the date at which we announce ourselves as ready to deal with the applications.

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FINALLY, in order to avoid all possible misunderstanding, we wish to make it quite clear that the use of our various departments is in no way obligatory on subscribers proposing to transact any of the business which falls within their scope. Those who prefer to provide for their practical professional requirements through the old channels will be quite at liberty to do so, and no subscriber will be under the least compulsion to disturb his existing arrangements. Whether the advantages offered by the New Professional Centre will be such as to make it worth while to disturb these existing arrangements will be a question for each individual subscriber to determine for himself.



## NOTES FROM FOREIGN JOURNALS.

## TO MAKE A STRICT MILK-DIET TOLERATED.

Many patients are unable to tolerate a strict milk-diet, due in some cases to real intolerance, and in others to prejudice, which becomes an auto-suggestion of a kind, but which can be overcome by persuasion. In a recent lecture, Professor Robin pointed out a method by which, with the help of certain drugs, it is possible to make this form of diet tolerable in the majority of cases. As suggestion takes the chief part in this method, it is impossible to be too careful in giving precise directions to the patient and to his *entourage*.

1. Between 7 o'clock in the morning and 10 o'clock at night, the patient should take, every three hours by sipping, 300, 400, or 500 grammes (10, 15, or 17 ounces) of warm milk, not boiled (in order to preserve the action of the ferments), allowing half an hour for the absorption of each amount. This quantity is gradually to be increased to 600, 700, or even to 800 grammes (20, 23, or 26 ounces) for each dose until the amount taken during the day is 4 litres (7 pints).

2. After taking each dose the patient must lie down on a couch with warm flannels to the pit of the stomach, remaining perfectly quiet for half an hour.

3. Before each dose of milk he should take, in a little water, three drops of one of the following mixtures, according to whether vomiting is present or not:—

a. If there is no vomiting—

|                         |   |   |   |   |   |                     |
|-------------------------|---|---|---|---|---|---------------------|
| ℞ Solanini              | - | - | - | - | - | gr. iss.            |
| Acidi Sulphurici Diluti | - | - | - | - | - | q.s. pro dissolv.   |
| Picrotoxini             | - | - | - | - | - | gr. $\frac{1}{2}$ . |
| Morphinæ Hydrochloridi  | - | - | - | - | - | gr. j.              |
| Cocainæ Hydrochloridi   | - | - | - | - | - | gr. $\frac{1}{2}$ . |
| Atrophinæ Sulphatis     | - | - | - | - | - | gr. $\frac{1}{2}$ . |
| Ergotini (Yvon)         | - | - | - | - | - | gr. xv.             |
| Aquæ Laurocerasi        | - | - | - | - | - | ʒiij.               |

Misce. Fiat mistura.

This mixture requires filtering after mixing.

b. If vomiting is present—

|                           |   |   |   |   |   |                     |
|---------------------------|---|---|---|---|---|---------------------|
| ℞ Picrotoxini             | - | - | - | - | - | gr. j.              |
| Spiritus Vini Rectificati | - | - | - | - | - | q.s. pro dissolv.   |
| Morphinæ Hydrochloridi    | - | - | - | - | - | gr. j.              |
| Atropinæ Sulphatis        | - | - | - | - | - | gr. $\frac{1}{2}$ . |
| Ergotini (Yvon)           | - | - | - | - | - | gr. xv.             |
| Aquæ Laurocerasi          | - | - | - | - | - | ʒiij.               |

Misce. Fiat mistura.



4. After each dose of milk the patient takes a tablespoonful of elixir of pepsin or half-a-gramme ( $7\frac{1}{2}$  grains) of pepsin in a cachet.

5. After the first, third, and fifth doses of milk, one of these powders is to be taken, mixed in a little water:—

℞ Magnesiae Levis,  
Sodii Bicarbonatis - - - - - ana ʒij.  
Sacchari Albi,  
Cretae Præparatæ - - - - - ana ʒiij.  
Misce pro pulveribus xxiv.

6. In the case of flatulence and meteorism the patient takes with the second, fourth, and sixth doses of milk a tablespoonful of:—

℞ Ammonii Fluoridi - - - - - gr. iiij.  
Aquæ Destillatæ - - - - - ʒx.  
Misce. Fiat mistura.

7. In the case of pain, cramp, a burning feeling, eructation, twitching, oppression, heartburn, or any painful sensation whatever affecting the stomach, one of the following powders, mixed in a little water, is to be given immediately:—

℞ Magnesiae Levis - - - - - gr. xxii.  
Sodii Bicarbonatis - - - - - gr. xv.  
Sacchari Albi - - - - - gr. xxx.  
Codeinæ - - - - - gr.  $\frac{1}{2}$ .  
Cretae Præcipitatæ,  
Bismuthi Subnitratis - - - - - ana gr. xij.

Misce pro pulvere i. Mitte tales numero x.

8. In the case of diarrhœa the patient should take after each dose of milk a cupful of infusion of 20 grains of wild strawberry roots. If this is not enough, a bolus of the following must be taken after each dose of milk:—

℞ Diascordii,  
Bismuthi Subnitratis - - - - - ana ʒj.  
Misce pro pilulis xvj.

9. In the case of constipation the bowel should be washed out daily with plenty of warm boiled water. If this is not sufficient 1 to 3 of the following pills should be taken each night at bedtime:—

℞ Aloes - - - - - gr. j.  
Cambogiæ - - - - - gr. ss.  
Extracti Hyoscyami,  
Extracti Belladonnæ - - - - - ana gr.  $\frac{1}{2}$ .  
Extracti Glycyrrhizæ - - - - - gr. ij.

Misce pro pilula i. Mitte tales numero xx.

(*Journal de Médecine et de Chirurgie pratiques.*)

#### TREATMENT OF UNCONTROLLABLE VOMITING IN PREGNANCY.

Rudaux and Cartier, in a recently published work (*Consultations et formulaire de la grossesse*), lay down the following as the lines upon which to

deal with uncontrollable vomiting in pregnancy.

*Prophylactic Treatment.*—An anti-toxic diet must be ordered for every patient who suffers from vomiting, which should not be looked upon as a sympathetic symptom of pregnancy.

1. White diet. Milk or water as the beverage.
2. A laxative every evening.
3. A copious enema of boiled water every morning.
4. "Aromatic friction" of the whole body once a day.
5. Walks in the open air.

*Curative Treatment.*—1. Strict milk diet: a small cupful of milk every half hour.

2. Every other day a purgative enema to be given.

℞ Sennæ Foliarum,  
Sodii Sulphatis - - - - - ana ʒss.  
Aquæ vel Lactis - - - - - ʒvi.  
Misce. Fiat enema.

3. On each intermediate day with No. 2 intestinal lavage is to be carried out with a litre of boiled water or of artificial serum.

℞ Sodii Chloridi - - - - - ʒi.  
Obi Vitelli - - - - - No. i.  
Aquæ Sterilisatæ - - - - - ʒxxxvi.

4. Inhalations of oxygen (50 litres in all) to be made three or four times a day.

5. Avoid cold by wearing woollen garments.

6. Every day, or every other day, 8 to 10 ounces of artificial serum to be injected.

7. Every evening at bedtime an enema containing—

℞ Chloralis Hydratis - - - - - gr. xxx.  
Lactis - - - - - ʒvj.

8. The pulse and temperature are to be noted morning and evening, and the total amount of urine passed in each 24 hours to be measured.

9. In the case of prostration, every day for a week is to be given an hypodermic injection of 1 c.c. (mxxvij.) of a five per cent. solution of cacodylate of soda in distilled water.

10. When the pulse constantly remains above 100, and when the amount of urine passed is below 18 ounces, the pregnancy must be stopped. Occasionally the dilatation of the cervix, the first step in inducing abortion, is sufficient to put a stop to the vomiting, and the pregnancy may be allowed to go to term.

#### THE DAY-DRESSING IN DERMATOLOGY.

Pautrier remarks on the difficulty of finding a dressing in skin disease which can be kept applied all day. Many a dermatosis, localised and not serious, is greatly benefited by continuous treatment. The difficulty is to find a protective excipient which is not removed by mere contact and which does not soil linen. The choice is limited to plasters, rolls of ointment, and

casein ointments. Plasters, which are now made very thin, very supple, and very adhesive, have to be changed every twenty-four hours, and the skin then requires cleaning with ether. They should be reserved for dermatoses without irritation, for dry, scaly, and hyperkeratosed lesions. The sticks of ointment, having for basis lanoline and wax, or cacao butter, vaseline and olive oil, should have a firm consistence, and be quite unctuous to the touch. They are very useful in the intermittent treatment of dermatoses of the face. Casein ointments have a liquid consistency, but when applied to the skin they are easily dried and form a sort of protective varnish, which is elastic and porous, and allows of perspiration from the skin. It is spread over the affected area with a spatula or a carefully cleaned finger.

After powdering with talc a varnish is obtained which is extremely supple and agreeable to the skin. It is very adherent and does not come off on simple contact.

The ointment (type of Unna) is thus prescribed :—

|                  |   |   |   |   |      |             |
|------------------|---|---|---|---|------|-------------|
| <b>R</b> Caseini | - | - | - | - | -    | ℥iijss.     |
| Liquor Potassæ   | - | - | - | - | -    | ℥v.         |
| Glycerini        | - | - | - | - | -    | ℥iss.       |
| Paraffini Mollis | - | - | - | - | -    | ℥vj.        |
| Acidi Carbolicæ, |   |   |   |   |      |             |
| Zinci Oxidi      | - | - | - | - | ana  | gr. viiiss. |
| Aquam            | - | - | - | - | - ad | ℥iv.        |

Misce.

With this can be incorporated many different drugs. Cleaning is easily carried out with pledgets of wool soaked in warm boiled water. It forms an ideal permanent day dressing for all dermatoses which are irritable, inflamed, and weeping.—(*La Presse Médicale*.)

#### THE INDICATIONS FOR LAVAGE OF THE STOMACH.

Lavage is made use of, therapeutically, in slight cases of stenosis, in gastropnoia with motor insufficiency, and in chronic catarrh with excessive fermentation, with the object of introducing certain drugs into the stomach. It is useless and even harmful to wash out the stomach too often. The presence in the stomach of masses of food only causes symptoms when the emptying of the stomach is not carried out in a normal time. Then are formed the fatty acids which act upon the mucous membrane, and the gas which distends the abdominal wall. In such conditions lavage can bring about great relief, but the symptoms can be much diminished by observing certain physical and mechanical laws, by giving alkalines, drugs which stop fermentation, and by electric treatment. Daily lavage is only allowed in the severe form of dilatation of the stomach, and in cicatricial contractions of the pylorus or in its neighbourhood when the patient does not wish to have an operation performed. In such cases the lavage should be done immediately after rising. In addition, in cases of abundant fermentation there will be prescribed salicylic preparations, menthol dissolved in chloroform, cocaine, or oil of sweet almonds. Iodized solutions of potassium iodide suit the stenotic forms of chronic gastritis and cases of total gastric achylia. Lavage should only be used when precise indications are present and should



not be left for the patient's discretion, any more than massage or galvanism  
—(*Münchener medizinische Wochenschrift*.)

### THE TREATMENT OF FEBRILE CONDITIONS IN CHILDREN.

Lemanski devotes a chapter in the new edition of his *Art pratique de formulei* to the employment of antipyretics for children, giving the following prescriptions:—

*For hypodermic injection:—*

|                         |   |   |   |          |
|-------------------------|---|---|---|----------|
| ℞ Quininæ Hydrochloridi | - | - | - | gr. xlv. |
| Phenazoni               | - | - | - | gr. xxx. |
| Aquæ destillatæ         | - | - | - | ℥iij.    |

Half a Pravaz syringe full to be given.

*For a suppository:—*

|                      |   |   |   |            |
|----------------------|---|---|---|------------|
| Quininæ Hydrobromidi | - | - | - | gr. v.     |
| Phenazoni,           |   |   |   |            |
| Phenacetini          | - | - | - | ana gr. j. |
| Olei Theobromatis    | - | - | - | gr. xxx.   |

Misce. Fiat suppositorium.

*For pastilles:—*

|            |   |   |   |        |
|------------|---|---|---|--------|
| Euquininæ, |   |   |   |        |
| Phenazoni  | - | - | - | gr. j. |

To be made into pastilles with vanilla chocolate, 3 or 4 to be taken daily.

*For an enema:—*

|                      |   |   |   |         |
|----------------------|---|---|---|---------|
| Phenazoni            | - | - | - | gr. xv. |
| Quininæ Hydrobromidi | - | - | - | gr. vj. |
| Aquæ Tiliæ           | - | - | - | ℥v.     |

Misce. Fiat enema.

To be given after a purgative enema.

*For a draught:—*

|            |   |   |   |               |
|------------|---|---|---|---------------|
| Phenazoni  | - | - | - | gr. viij-xvj. |
| Syrup      | - | - | - | ℥j.           |
| Aquæ Tiliæ | - | - | - | ad ℥iiss.     |

Misce. Fiat mistura. Capiat ℥j. 2 dis. horis.

*For a powder:—*

|             |   |   |   |              |
|-------------|---|---|---|--------------|
| Euquininæ,  |   |   |   |              |
| Phenazoni   | - | - | - | ana gr. iss. |
| Acetanilidi | - | - | - | gr. ¼.       |

Misce. Fiat pulvis.

Two or three to be taken in the day in jam or sweetened milk.

It is scarcely necessary to add that the antipyretic remedy *par excellence* for children is a bath of one sort or another.



## Practical Notes.

THE RELIEF OF PAIN IN NEURALGIA.—According to the teaching of Sir William Whitla for the relief of pain in neuralgia nothing can be compared with morphia when administered hypodermically, but it should never be resorted to in chronic and very seldom even in acute cases, owing to the danger of the establishment of the opium-habit. This is almost certain to follow if the patient be once permitted to use the syringe himself. The same rigid caution should be exercised in the use of cocaine, alcohol, Indian hemp, or other narcotic. Sir William Whitla's method of deep parenchymatous injection of a very diluted solution of morphia lodged at several places in the trunk of the affected nerve or around its sheath, is a combination of acupuncture, aquapuncture, hypodermic injection, and anodyne medication, and may be safely tried for a few times at the beginning of the treatment; it is not only palliative, but sometimes a speedy and permanent curative effect follows, especially in neuralgic sciatica. Drugs of the analgesic class which have little or no action on the cerebral functions are often invaluable, as antipyrin, phenacetin, exalgin, antifebrin, butyl-chloral hydrate, salol, salicylates, and bromides. Perhaps the most reliable of all this class of agents is aspirin in doses of about 15 grs. twice or thrice daily. Quinine, which is almost specific in malarial cases, is often most beneficial in the non-malarial types of the disease; those who deny its value probably use it in doses which are too small: less than 15 grs. daily need not be tried. Chloride of ammonium, phosphorus, strychnine, zinc phosphide, and a host of drugs have been vaunted as specifics; undoubtedly most of them will occasionally give a satisfactory result, but there are as yet no clear indications for the selection of many of them. Gelsemium, aconite, and butyl-chloral are believed to possess a special action upon the trigeminal nerve, and bromides appear to have some special influence over the forms of ovarian neuralgia. The value of iodides and salicylates is unquestionable in rheumatic cases and in the neuralgias occurring in the late stages of

syphilis. Nitroglycerin may be empirically tried in any type of the disease. Local agents for the relief of pain are almost innumerable ; menthol, cocaine, antipyrin, aconite, belladonna, chloroform, and every known local analgesic have been recommended and occasionally found useful. Freezing by ethyl chloride or ether often gives temporary ease. Counter-irritation by blistering, by thermo-cautery, or other method may be used, and electricity in different forms is valuable. The injection of osmic acid into the affected nerve should always be tried before resorting to operative measures.

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TREATMENT OF VOMITING IN PHTHISIS.—By far the most obstinate cases to deal with are those in which there is excessive irritability of the stomach, omitting cases of catarrhal gastritis. Dr. S. H. Habershon shows how in these cases vomiting follows shortly after a meal, and is often preceded by a sense of suffocation, without pain and with or without violent cough. Sometimes the cough is very slight. Recourse may then be had to the use of liquor potassae (1 to 5 minims for a dose), usually with calumba, with sometimes a few minims of Battley's solution of opium or of laudanum added. The success of this remedy is probably due to the fact that it counteracts the excessive acidity of stomach which is often present, and which is itself sufficient to keep up a certain amount of irritability of the gastric mucous membrane. It is also of value where the bronchial secretion is viscid, from the property of alkalies of rendering such a secretion more fluid. The well-known combination of creasote and opium is frequently of great benefit. Finally, if all other remedies fail to control vomiting, a plan has been recommended by Codrecu, for which he claims absolute success ; he injects hypodermically one-sixth to one-fourth of a grain of morphine in the epigastric region, the patient being, of course, kept in bed or in the recumbent position. Dr. Habershon's experience of this remedy is that it is well worthy of trial in the cases that are occasionally met with in which vomiting from this cause is exceedingly intractable. In all cases of vomiting with the cough, the patient should be recommended not to exert himself after a meal, but to lie



down for half an hour or an hour, while in extreme cases he should be confined to bed.

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**TREATMENT FOR INTESTINAL WORMS.**—The following useful summary of the symptoms of intestinal worms and their treatment is furnished by Dr. T. D. Savill, who points out that intestinal worms may give rise to no symptoms at all. These worms are most frequently met with in children, and may remain undiscovered until they are found in the stools. The symptoms are very indefinite, and consist of vague and persistent, though often paroxysmal, pains in the abdomen; capricious and sometimes ravenous appetite, in spite of which the child becomes thin and sallow; grinding of the teeth at night, picking of the nose, and other reflex phenomena; irregularity of the bowels, or diarrhoea; threadworms produce intense itching of the anus, and consequently fidgetiness, especially at night. They may wander forwards and cause vulvitis. The treatment differs for the different worms. For threadworms the best treatment consists of quassia injections. After an aperient, one ounce of powdered quassia to a pint of boiling water is, when cold, injected into the bowel, and retained as long as possible. Common salt injections of the same strength may be used. The worms are destroyed with two or three such injections. Santonin (1 grain) in a powder with calomel is very efficacious; it should be given on alternate days for three doses, followed by castor-oil. Where the worm has its habitat high up in the intestine (as the tapeworm) treatment is conducted in three stages. (1) In order to starve the parasite by keeping the alimentary canal as empty as possible, the patient should have no food after midday, and at night or the next morning a purgative must be taken. This leaves the worm uncovered, and thus readily acted upon by (2) the anthelmintic, which is given about an hour after purgation. The chief anthelmintic is *ext. filicis liq.* 1 drachm. Some recommend 30 minims of spirits of turpentine to be given with this; others give kousso (4 drachms) or pelle-tierine (2 grains of the alkaloid). (3) Two hours later give calomel with a saline aperient, to eject the worm from the

body. The stools must be examined to see that the head is passed. If only segments are passed, the worm will grow again, and the same treatment will have to be repeated within three months. For the round worm the specific remedy is *santonin*, given in 2 grain doses to a child of three and upwards; for an adult 5 grains are given.

**THE TREATMENT OF WARTS.**—The successful treatment of warts is a subject that now and then becomes a matter of some interest to medical men, and Dr. Graham Little's views on the matter are of great practical value; after mentioning that the common wart, as it occurs upon the skin, is most frequent in children, and appears to follow a mild local irritation, he observes that internal medicines may be combined with local applications, especially where the warts are numerous. Arsenic is the best of these; Epsom salts may also be tried. For local use the following are suggested:—One part of Hydrarg. Chlor. Corrosiv. with 25 parts Collodii Flexilis painted on the wart once a day.

|                       |   |   |   |          |
|-----------------------|---|---|---|----------|
| R Potassii Bichromat. | - | - | - | gr. iij. |
| Petrolati             | - | - | - | ʒj.      |

Rub into the wart at night.

|                  |   |   |   |         |
|------------------|---|---|---|---------|
| R Chloral. Hydr. | - | - | - | 1 part. |
| Acid. Salicyl.   | - | - | - | 4 "     |
| Acid. Acetic     | - | - | - | 1 "     |
| Ætheris          | - | - | - | 5 "     |
| Collodii         | - | - | - | 15 "    |

Paint on wart once a day.

|                      |   |   |   |         |
|----------------------|---|---|---|---------|
| R Ext. Cannabis Ind. | - | . | - | 1 part. |
| Acid. Salicyl.       | - | - | - | 2 "     |
| Collodii             | - | - | - | 40 "    |

Paint on wart once a day.

When these fail, curetting is probably the simplest and most efficacious of other methods of removal. The wart and surrounding skin are thoroughly scrubbed, and then the wart—and the surrounding skin for about  $\frac{1}{4}$ -inch—frozen with ethyl chloride; the wart is removed with a sharp curette and dressed with a dry antiseptic dressing.



## Preparations, Inventions, etc.

### DIAMALT WITH COD-LIVER OIL.

(London: The British Diamalt Company, 11, Southwark Street, S.E.)

We have received samples of Diamalt mixed with cod-liver oil in varying strengths. In one of the samples submitted for examination the cod-liver oil mixed in with the product amounts to 15 per cent. by weight, and in the other the proportion of cod-liver oil is as high as  $33\frac{1}{3}$  per cent. by weight. An important point observed is the freedom from preservatives and from foreign ingredients such as flavouring substances. An essential condition for the success of these products is the removal of the taste of cod-liver oil, and it is noteworthy how well this difficult task has been achieved by the use of aromatic malt. Diamalt with cod-liver oil places at the disposal of medical men a convenient and ready method of administering cod-liver oil, and the therapeutic value of the product is enhanced by reason of the label placed on each jar stating the percentage of oil present, thus furnishing accurate and reliable data for purposes of dosage.

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### SWEET WHEY POWDER, DRIED MILK AND EGG POWDERS.

(London: Casein, Ltd., Culvert Works, Battersea, S.W.)

In the course of an address delivered before the Medico-Chirurgical Society of Central New York, Mr. L. C. Merrell, after saying that a powdered whey might be used either as a modifier of milk and cream or as a complete food in itself, proceeded to point out that the fact of whey powder being a natural product, and its ingredients practically not differing in character from their original condition in fresh milk, rendered the material specially desirable from an ethical standpoint. This pronouncement does not in any way overstate the case for whey powder, and when it is remembered that the methods used in its manufacture are in nowise secret, and that the utility of whey is so widely known, it will be recognised at once



that it is unnecessary to formulate any extraordinary claims as to the beneficial results it will produce in cases where its use is indicated.

The exact composition of the sweet whey powder sent us for inspection is as follows:—Moisture 1·20, fats ·27, soluble lact-albumin 14·25, ash 9·80, and milk sugar 74·45. It appears to us that an excellent method of using this whey powder is to prepare it with water and cream; the cream is low in casein, sugar, and ash, but high in fat, whilst the whey powder is low in fat but high in ash, sugar, and albumen, which are lacking in cream. This dry preparation is certainly very satisfactory and serviceable and possesses an agreeable taste quite free from sourness.

The preparation of milk in the form of powder issued under the name of "Trumilk" contains a full share of fat, it is perfectly soluble in warm or cold water, and the milk made in accordance with the directions on the tin forms a product comparable to fresh milk from the cow, and having the further advantage of being Pasteurised.

The sample of egg powder named "Truegg" is an excellent representation of a natural food substance; it contains the yolk and the white of the fresh egg in powder form, and can be utilised in those cases in which there is difficulty in securing a reliable supply of fresh eggs. The following is the result of analysing this egg powder:—Moisture 4·3 per cent., mineral matter 3·7 per cent., protein 54 per cent., and fats 38 per cent.

#### "ZANA" CARBONATED EFFERVESCENT BATHS.

(London: The Hygienic Co., Ltd., 36, Southwark Bridge Road, S.E.)

A vast amount of scientific investigation has been bestowed of late on the treatment of diseases of the heart and of the circulatory and nervous systems by means of carbonated baths, and it is interesting to note that an improvement in the quantitative and local application of carbonic acid in baths has unquestionably been made by the "Zana" (Dr. Zucker's) artificially carbonated baths with porous cloth bags known as "cushions." In these baths the carbonic acid is developed by the action of formic acid on bicarbonate of soda contained

in the cushions. This method of putting up the bicarbonate of soda in porous bags has two advantages ; in the first place, the development of the gas is almost completely under the control of the bather and attendant, and in the second place, an increased local discharge of the gas, together with a more intense local action upon specially affected parts of the body, can be obtained. Such affected parts can be subjected to massage with the cushions containing the bicarbonate of soda, and in this manner, by bringing more carbonic acid to bear on the place, the action of the gas on the circulation of the blood in the skin is decidedly increased. The objectionable feature of a too copious development of gas at the commencement of a carbonated bath is satisfactorily obviated in these "Zana" baths, which are free from the defect.

*'VAPOROLE' PITUITARY (INFUNDIBULAR) EXTRACT.*

(London : Messrs. Burroughs Wellcome & Co.)

The therapeutical indications afforded by recent research and investigations into the physiological and pharmacological properties of the infundibulum or posterior lobe of the pituitary body have borne fruit in the valuable clinical results obtained. It has been shown that intravenous injection of the extract of the infundibular lobe of the pituitary body causes a rise of blood pressure resulting from a very general vaso-constriction, the beat of the heart being rendered, as a rule, perceptibly slower, though it may be somewhat augmented in energy ; the distribution of this vaso-constriction has no relation to innervation by the sympathetic system, the pulmonary and coronary vessels being affected in common with the arterioles of the system generally. It appears that the extract is a general stimulant of plain muscle, and though it seems to act on the muscular coats of certain organs preferentially, this distribution has no relation to innervation. The organs which appear thus especially sensitive to the action are the arteries, the spleen, and the uterus. A further effect noted of the intravenous injection of the extract is a great increase in the rate at which urine is secreted, and the action on the kidney is so marked that the preparation is perhaps the most powerful of the known diuretics. In cases of renal and

cardiac disease the extract causes a stronger, ampler, but slower pulse wave, and there is a considerable rise in blood-pressure, the greatest rise being noticed a little more than fifteen minutes after the injection, lasting for an hour or more. This protracted period of pressure indicates the value of the extract in the treatment of shock. Another therapeutic effect which is likely to be of great value is the contraction of the uterus produced by the extract, and the indications for its use for this purpose are similar to those which apply in the case of ergot. The best mode of administration is by intramuscular injection. When given by the mouth it is but slowly absorbed. A suitable dose is 0.5 c.c. to 1 c.c. of a 20 per cent. extract, representing 0.1 gramme to 0.2 gramme of fresh infundibulum. The injection is best given in the gluteal region, and the usual antiseptic precautions should be taken. When it is necessary to give a second or subsequent dose, it should be remembered that such dose will not produce more than a small fraction of its proper effect unless some time has elapsed since the previous dose was given. 'Vaporole' Pituitary (Infundibular) Extract is issued in hermetically-sealed containers, and, being sterile and stable, is suitable for intramuscular injection.

#### CARLSBAD SPRUDEL-SALT.

(London: Messrs. Ingram & Royle, Ltd.)

This salt contains the essential ingredients of the Carlsbad Sprudel mineral water from which it is obtained by evaporation. The method of putting up this natural mineral water in a convenient form for use enables the treatment of cases suitable for the Carlsbad cure to be undertaken when it is found impossible for patients to make the journey to the watering place. The salt is alkaline and readily soluble in warm or in cold water. The most efficient way of securing a diuretic effect with this medicament is to order small and frequent doses, but as an aperient the salt should be given before breakfast in doses of from one to two teaspoonfuls dissolved in water, the object being to secure the administration on an empty stomach.

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# THE PRACTITIONER.

DECEMBER, 1909.

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## PASTEUR, SCIENCE AND MEDICINE.<sup>1</sup>

By F. M. SANDWITH, M.D., F.R.C.P.,

*Gresham Professor of Physic; Lecturer, London School of Tropical Medicine;  
Lecturer on Tropical Diseases, St. Thomas's Hospital, etc.*

LOUIS PASTEUR was born at Dôle, in France, in 1822. His father was a man of little education, but of great natural industry and intelligence; he was "drawn" as a conscript in 1811, went through the Peninsular campaign in the 3rd Regiment, which was called "brave amongst the brave," and was decorated with the Cross of the Legion of Honour by Napoleon I. Soon after his return from the wars he married Jeanne Roqui, and the young couple settled at Dôle. Louis was their third child. Some sixty years later a memorial plate was placed on the house to commemorate the birth of Louis Pasteur, of whom Dôle had then become justifiably proud. The Director of Fine Arts of France, representing the Government on the occasion, pronounced these words:—

"In the name of the Government of the Republic, I salute the inscription which commemorates the fact that in this little house, in this little street, was born, on December 27, 1822, he who was to become one of the greatest scientists of this century, so great in science, and who has, by his admirable labours, increased the glory of France and deserved well of the whole of humanity."

To which Louis Pasteur answered:—"I am profoundly moved by the honour done to me by the town of Dôle; but allow me, while expressing my gratitude, to protest against this excess of praise. By according to me a homage rendered usually but to the illustrious dead, you anticipate too much the judgment of posterity. But after protesting against the brilliant testimony of an admiration which is more than I deserve, let me tell you that I am touched, moved to the bottom of my soul. Your sympathy has joined on that memorial plate the two great things which have been the passion and the delight of my life: the love of science and the cult of the home. My father and my mother, dear

<sup>1</sup> An Address delivered at Gresham College.

departed ones, who lived so humbly in this little house, it is to you that I owe everything. Your enthusiasm, my brave-hearted mother, you have instilled into me. If I have always associated the greatness of science with the greatness of France, it is because I was impregnated with the feeling which you had inspired. And you, dearest father, whose life was as hard as your hard trade, you have shown me what patience and constant effort can accomplish. It is to you that I owe perseverance in daily work. Not only had you the qualities which go to make a useful life, but also admiration for great men and great things. To look upwards, learn to the utmost, to seek to rise ever higher, such was your teaching. I can see you now, after a hard day's work, reading some story of the battles in the glorious days of which you had been a witness. Whilst teaching me to read, your care was that I should learn the greatness of France."

Soon after the birth of Louis the family settled at Arbois, where the boy was sent to school. There is no evidence of his having shown any precocious cleverness. Like many other men distinguished later in life, his mind developed slowly, and during his school days he was only considered a good, average scholar, industrious, and very conscientious, with a marked talent for drawing. He was fortunate in his parents. From the first his best friend was his father, whose intense interest in his children's education must have been the most effective stimulant to their enthusiasm. Hampered by very narrow means and his own lack of education, the father was determined to make every sacrifice to give to his children the best teaching procurable, and the home life was ennobled by this spirit of sacrifice, and by the high ideals and patriotism of both parents.

Years later, when Pasteur was working in Paris, his father, still anxious to master his own lack of learning, entered into a teaching correspondence with him, the son setting the lessons, the father sitting up late at night to prepare the answers to be sent to his boy in Paris.

The son was fortunate also in the friends whom the Pasteurs gathered round them, and owing to their influence Louis was sent, at the age of 15, to a school in Paris. But this proved to be too hard a trial to the home-loving, sensitive boy, who fretted so persistently that his father brought him

home a few months later. For a time he appeared to be satisfied with the narrow life of the little provincial town and gave up most of his time to his artistic work, but his feverish desire for study soon overcame his reluctance to leave home, and he entered the college of Besançon, 25 miles away. Here he was advanced to the post of assistant master and worked with unflagging zeal to prepare himself for the final examination. He did not succeed in passing this with any distinction, and therefore determined to return to Paris to try again.

His industry was tremendous. To try to relieve his parents of some of the expense of his education he gave lessons to younger students whilst he continued his own studies, visited libraries, and attended lectures. Amongst others he listened to those of Dumas, a celebrated chemist, who was the first to fill him with enthusiasm for this subject, of which he was to become so great an exponent. He passed his examinations successfully and entered the *École Normale*, continuing to teach others while he was being taught. This love of work for the sake of work is shown in his early days and continued all through his laborious and noble life. If genius consists in an infinite capacity for taking pains, there was never a greater genius than Pasteur. He was always most modest of his own achievements, but full of fiery enthusiasm for the work of others.

Speaking many years later to some students at Arbois of the success he had attained in his researches, he attributed it to "assiduous work, with no special gift but that of perseverance joined to an attraction towards all that is great and good." This was the keynote of his life, an intense love of work and a passionate desire to help the world forward.

It was in his student days, at the age of 22, that his attention was first attracted to certain acids, tartaric acid and paratartaric acid, which were puzzling the analytical chemists of the day. Pasteur could not then give sufficient time to the problem, but certain flashes of insight which might solve the problem had come to him, and he was determined to return to the subject as soon as possible. He passed his Physical Science competition, and was taken into the laboratory of Balard, a lecturer at the school, who had the insight to recognise in the retiring and studious pupil the signs of a great



scientist of the future. Pasteur now devoted much time to working at crystals, and writing of this time he says:—"I began to study carefully the formations of a very fine series of combinations, all very easily crystallised, tartaric acid and the tartrates." These researches, worked out under great difficulties, in opposition to previous theories, solved some problems which had long been discussed in the scientific world, and their solution caused great sensation among those who understood their value. He always had the power of proving his theories till they became facts and could not be denied, and he was never satisfied with his own work till he could thus prove it.

This work on crystals was his first contribution to science, and brought him infinite joy.

We next find him, in 1848, as Professor of Physics at Dijon, where he took up his work with his accustomed thoroughness, although it was a bitter disappointment to him to renounce temporarily his laboratory work.

The well-equipped laboratories of the present day are rendered perfect with every facility that light, air, water and instruments can give, but it was very different in France in those early days of Pasteur's work, when the greatest scientists had to study in cellars or in attics with no aids of any kind, and often had to labour at the expense of their health. Yet to Pasteur work in such a hovel was the acme of happiness!

Fortunately he was not long condemned to teaching work only, his friends in Paris persuaded the authorities to give him a post where he could carry on scientific investigations, and, in 1849, he was appointed Assistant Professor of Chemistry at Strasburg, then, of course, a French town. Here he married Marie Laurent and lived a happy, hard-working life for five years. His teaching, as well as his writing, became celebrated for the manner in which he made the most difficult subject clear and interesting. Biot, the great scientist, said of him, "He throws light upon everything he touches." In 1853 the red ribbon of the Legion of Honour was given to him for his scientific work; and, with 1,500 francs given him as a prize by the Pharmaceutical Society, he was able to buy instruments which the Strasburg laboratory was too poor to procure.

In 1854 he was made Professor and Dean of the Science Faculty at Lille University, and here he was able to carry out

a plan he had long cherished, of bringing industry and science into closer touch, of putting his laboratory at the disposal of young men preparing for an industrial career, and teaching them the elements of science as applied to local industries.

"Where will you find," he said, "a young man whose curiosity and interest will not immediately be awakened when you put into his hands a potato, when with that potato he may produce sugar, with that sugar alcohol, with that alcohol, ether and vinegar? Where is he that will not be happy to tell his family in the evening that he has just been working out an electric telegraph? Be sure such studies are seldom, if ever, forgotten. It is somewhat as if geography were taught by travelling; such geography is remembered because one has seen the places. In the same way your sons will not forget what the air we breathe contains when they have once analysed it, when in their hands and under their eyes the properties of its elements have been resolved. Without theory, practice is but routine born of habit. Theory alone can bring forth and develop the spirit of invention. It is for you not to share the narrow opinion which disdains everything in science which has not an immediate application. You know Franklin's charming saying? He was witnessing the first demonstration of a purely scientific discovery, and people around him said: 'But what is the use of it'? Franklin answered them: 'What is the use of a new born child'? Yes, gentlemen, what is the use of a new born child? And yet, at that tender age, germs perhaps exist in it of great talent. In your baby boys, fragile beings as they are, there are incipient magistrates, scientists, heroes as valiant as those who are now distinguishing themselves under the walls of Sebastopol. And thus, gentlemen, a theoretical discovery has but the merits of its existence; it awakens hope, and that is all. But let it be cultivated, let it grow, and you will see what it will become. Do you know when it first saw the light, this electric telegraph, one of the most marvellous applications of modern science? It was in that memorial year, 1822: Oersted, a Danish physicist, held in his hands a piece of copper wire, joined by its extremities to the two poles of a Volta pile. On his table was a magnetized needle on its pivot, and he suddenly saw the needle move and take up a position quite different to the

one assigned to it by terrestrial magnetism. A wire carrying an electric current deviates a magnetized needle from its position. That was the birth of the modern telegraph. Franklin's interlocutor might well have said when the needle moved 'But what is the use of that'? and yet that discovery was barely twenty years old when it produced by its application the almost supernatural result of the electric telegraph."

Pasteur's lectures attracted large audiences and became celebrated throughout the world, while his devotion to his teaching work was such that he would sacrifice days from his studies in the laboratory—and this was the greatest sacrifice to him—to take his pupils round factories and foundries in the neighbourhood. Speaking to an audience of medical students in Edinburgh in 1884, he said: "Ever since I can remember my life as a man, I do not think I have ever spoken for the first time to a student without saying to him, 'Work perseveringly; work can be made into a pleasure and alone is profitable to man, to his city, to his country.' Whatever career you may embrace, look up to an exalted goal; worship great men and great things. Great things! You have indeed seen them. In no country is the memory of great men better honoured than in yours. But if work should be the very life of your life, if the cult of great men and great things should be associated with your every thought, that is still not enough. Try to bring into everything you undertake the spirit of scientific method. You especially, medical students of this celebrated University of Edinburgh, be you inspired by the experimental method. To its principles Scotland owes such men as Brewster, Thomson, and Lister."

Other work was now in store for him. In 1856 some manufacturers of Lille had been disappointed in the failure of their alcohol made from beetroot, and Pasteur was consulted. He had already shown great interest in the study of ferments and now he threw himself with the deepest interest into this new research. After months of patient investigation he propounded new theories on fermentation which revolutionized chemistry and became, after years of opposition and strife, doctrines which cannot be refuted.

Fermentation had been spoken of as a "mystery," an "influence," but Pasteur recognised in it a phenomenon of life and of reproduction. He read a paper on lactic fermentation



before the Lille Scientific Society, bringing to light many newly discovered facts. That same year, 1857, he was appointed Administrator at the École Normale, his old school in Paris, and with his usual energy he set himself the task of administering every detail with thoroughness and sympathetic care. As a laboratory he had but a miserable garret, but his courage never failed him ; if the difficulties were great his perseverance was greater. He continued his work on ferments and read an epoch-making paper on alcoholic fermentation. Great problems were occupying his mind, but he would publish no theory till he had proofs. "In experimental science," he said, "it is always a mistake not to doubt when facts do not compel you to affirm."

In 1859 he lost his eldest child, and two other children died in the years that followed. It was a bitterness he never recovered from, for his love of children was always great, and he was deeply attached to his own.

In 1860 the Academy of Science conferred on him the prize for Experimental Physiology. At this time Pasteur wrote :—

"I am pursuing as best I can these studies on fermentation which are of great interest, connected as they are with the impenetrable mystery of life and death. I am hoping to mark a decisive step very soon by solving, without the least confusion, the celebrated question of spontaneous generation. Already I could speak, but I want to push my experiments yet further. There is so much obscurity, together with so much passion, on both sides, that I shall require the accuracy of an arithmetical problem to convince my opponents of my conclusions. I intend to attain even that. God grant that by my persevering labours I may bring a little stone to the frail and ill-assured edifice of our knowledge of those deep mysteries of life and death, where all our intellects have so lamentably failed."

It is difficult now for us to realize the storm of opposition raised by the theories Pasteur had propounded, theories in these days so firmly established that it never occurs to any of us to doubt them. But in 1860 many of the distinguished men of the day still believed that spontaneous generation took place continually. Pasteur now undertook to prove the contrary.

To do so, he drew a current of apparently pure air through

a tube containing a little cottonwool, and found that the wool, acting as a filter, had particles of dust deposited upon it, and that this dust contained organic spores and germs. "There are therefore," he argued, "some organized corpuscles in the air. Are they germs capable of vegetable production or of infusion? That is the question to solve." He made a series of experiments to prove that the most sensitive liquid, such as milk, if placed where no dust could reach it, remained pure an indefinite time. "Gases, fluids, electricity, magnetism, ozone, things known or things occult, there is *nothing* in the air that is conditional to life, except the germs that it carries," he concluded. His next experiments were to prove that the air on high mountains, beyond the reach of animal and vegetable decay, was so pure as to contain few or no spores, the air of cities, on the other hand, containing many. "If," he wrote in 1880, "all the results are compared that I have obtained until now, it seems to me that it can be affirmed that the dust, suspended in atmospheric air, is the exclusive origin, the necessary condition of life in infusions." And he added: "What would be most desirable would be to push those studies far enough to prepare the road for a serious research into the origin of various diseases."

The action of those little organisms in the air, the causes not only of fermentation but also of putrefaction and disorganization, was dawning upon him, but it was some years before he applied this intuition to real experiment. It may be said that he established the following facts, until then not understood:—Ferments are living beings. There is a special ferment corresponding to each kind of fermentation. Ferments are not born spontaneously.

He now turned his attention to the study of wine, for he was always interested in the practical application of his discoveries. "Might not the diseases of wines," he said, "be caused by organized ferments, microscopic vegetations, of which the germs would develop when certain circumstances of temperature, of atmospheric variation, of exposure to air, would favour their evolution or their introduction into wines? I have indeed reached this result that the alterations of wines are co-existent with the presence of, and multiplication of, microscopic vegetation."

He proved that it is the action of certain ferments present

in the air, and which cover the grapes ripened in the open, which causes the fermentation necessary to produce alcohol, and that the only safe means of checking the development of destructive ferments in the wine was to raise it to a temperature of from 120° to 140° F. "I have also ascertained," he wrote, "that wine was never altered by that preliminary operation, and as nothing prevents it afterwards from undergoing the gradual action of the oxygen in the air—the only cause, as I think, of its improvement with age—it is evident that this process offers every advantage." Several wine merchants adopted this precaution with success, and an experiment was later made with some wine for the fleet, which was sent to sea for ten months. Other wine that had not been heated, was found to be bad at the end of the time, while the previously heated wine was as good as ever.

In the year 1865 he was called away from his study of ferments by his friend Dumas, who begged him, on the part of the Government, to come to the assistance of a great industry which was being threatened with extinction, and before which other experts stood powerless to advise. The silk industry of France had been established for many generations, and had brought in, twenty years previously, the enormous sum of £4,000,000. But a disease broke out in the silkworm nurseries, destroying millions of worms and spreading to every country that bred them. "*Pébrine*," the name given to this disease, had brought the industry to the lowest ebb, was causing desolation among thousands of work-people, and could not be traced to any definite cause.

Pasteur set out at once to the stricken provinces, and tried to collect information wherever he went. He could get but contradictory and confused answers, but he was not easily dismayed by difficulties. He settled down in a small silkworm factory at Alais, and submitted specimens of diseased moths, eggs, and worms to microscopical examination. For two years he worked patiently, slowly, and surely, coming to definite conclusions as to the extent of the disease and the best method of preventing it. Finally his results were published, and the methods he advised were so simple that every producer could follow them. Roughly, this is what he recommended:—

"At the time when the moths leave their cocoons and



mate with each other, the cultivator separates them and places each female on a small square of linen, where she lays her eggs. The moth is afterwards pinned up in a corner of the same square of linen where she gradually dries up ; later on, in autumn or even in winter, the withered moth is moistened in a little water, pounded in a mortar, and the paste examined with a microscope. If the least traces of corpuscles appear, the linen is burnt, together with the seed, which would have perpetuated the disease."

A year later Pasteur returned to Alais eagerly awaiting the result of his suggestions, and it was a great joy to him to find that those who had been guided by his advice, who had practised seeding according to his prescriptions, had met with complete success ; others, who had not troubled to do so, had failed as in previous years. France was slow in generally adopting the means suggested, but Austria and Italy did so, and in due time France also was convinced, while Austria, in 1868, gave to Pasteur the prize "for discovering a preventive and curative remedy against pébrine." Eleven years later he represented France at a great International Congress of Silkworm Culture at Milan, in the course of which he visited a large silkworm establishment named after him. In a letter to his old friend and master, Dumas, he wrote : "I very much regret that you are not here, you would have shared my satisfaction. Here from July 4th sixty or seventy women are busy for ten hours every day with microscopic examinations of absolute accuracy. I never saw a better arranged establishment. 400,000 moth-cells are put under the microscope every day. The order and cleanliness are admirable : any error is made impossible by a second test following the first."

Sudden illness now attacked Pasteur, which very nearly robbed the world of him who was destined to carry out such great work in the future, whose life has saved thousands of lives already, and whose discoveries were to open a new era to the world of science and medicine. At the age of 45 he had a stroke of apoplexy, and for many weeks lay between life and death. Some of the greatest scientists of France nursed him tenderly at his bedside. But as time passed his friends were gratified to find that not only his physical paralysis gradually disappeared, but his mental activity returned

to its normal condition, and after a long rest he was able to return to his labours, to complete the great work of his life. In his return to health he saw only the new means of work and hurried back to his silkworm experiments.

The years that followed gave a new direction to Pasteur's thoughts, but before describing this it is well to mention here the study of beer and its diseases to which Pasteur devoted much attention in the year 1871. To do so on a larger scale than the small breweries of France afforded, he visited England, where he was courteously received by the manager of one of the largest breweries in London. He was shown round the works and he made some microscopic examinations of yeast and samples of beer. He certified the existence of certain noxious ferments which would inevitably spoil the beer then being produced, and stated that "every marked alteration in the quality of the beer coincides with the development of micro-organisms foreign to the nature of true beer yeast." The brewer's interest was roused, and he confessed that in the brewery there was a quantity of beer which had gone wrong only a fortnight after it was made, and was undrinkable, though he could assign no cause for the failure. "I examined it with a microscope," said Pasteur, "and could not at first detect any ferments of disease; but guessing that it might have become clear through the long rest, the ferments now inert having dropped to the bottom of the reservoirs, I examined the deposit at the bottom of the vats and found that it was entirely composed of filaments of disease unmixed with the least globule of alcoholic yeast. The fermentation of that beer had therefore been exclusively a morbid fermentation."

He was pleased to find, a week later, that the yeast in the whole brewery had been changed, and that a microscope had been procured. This eminently practical application of his teaching gave great pleasure to Pasteur. His final conclusions on the subject of beer were these:—

(1) Every alteration either of the infusion of malt or of the beer itself depends on the development of micro-organisms which are ferments of disease.

(2) These germs of ferments are brought by the air, by the ingredients, or by the apparatus used in breweries.

(3) Whenever beer contains no living germs it is un-

alterable.

He recommended heating the beer, like the wine, to destroy destructive ferments, and this process of heating, without boiling, came to be called "pasteurising."

In breweries, as in all chemical work, he insisted upon the necessity of absolute cleanliness. He carried this principle rigidly into practice, carefully wiping every glass or instrument before use, noting every speck of dust.

Shortly after his illness another great trial was in store for Pasteur, for to him, as to all patriotic Frenchmen, the year 1870-71 was darkened by the disastrous war with Prussia, by defeat and humiliation, besides terrible personal anxiety. His friends persuaded him to leave Paris, a half paralysed man could not fight, and would only be a useless mouth to feed, they pretended.

He went with his wife and daughter to Arbois, whence they watched the course of the war with the uttermost bitterness of feeling, whilst the son, a young student, went to the front as a volunteer. France was unprepared, while Prussia was armed and ready to the last button; no devotion to his country, no fervent desire to fight and bleed for her, could make the untrained Frenchman equal to the fully-trained, fully-prepared Prussian. It is no use entering into the details of that sad time, the iron of humiliation of his beloved France bit into the very soul of Pasteur, and he never forgave his country's enemy.

Pasteur's patriotism was a very real factor in his life. Whenever he could help the industries of France, raise her in the opinion of other countries, add lustre to her greatness, his joy was intense. It was one day, when he had made a very important discovery, *i.e.*, the vaccine to inoculate against anthrax, to which I shall refer later, that he said: "Nothing would have consoled me if this discovery had not been a French discovery!"

His great wish was that France, after her crushing defeat, should regain her great place among the nations by means of scientific triumphs.

It was terrible, during the war, to see how little the French surgeons had applied the teaching of Pasteur to their own science. England had given to the world the man who was



able to apply Pasteur's theory of germs to his own profession. Lister had realised as early as 1867 that living organisms and infectious germs in the air, the existence of which Pasteur had proved, were capable, not only of contaminating liquids and setting up putrefaction, but also were elements of danger, often of death, in wounds. He originated modern surgery. Sponges, drainage tubes, dressings, instruments, everything coming in contact with the wound was submitted to the most minute precaution of chemical cleanliness, and at once the surgeon became, what he now is, a saviour of life, not the executioner he had too often been in pre-antiseptic days. But during the Franco-Prussian war these truths had not yet penetrated to the ambulance tents. Sedillot writes from the war: "The horrible mortality amongst the wounded in battle calls for the attention of all the friends of science and humanity. The surgeon's art, hesitating and disconcerted, pursues a doctrine whose rules seem to flee before research. Places where there are wounded are recognizable by the stench of suppuration and gangrene."

Hundreds and thousands of wounded succumbed, not to their original wound, nor to the operation, but on the 8th or 9th day to gangrene or erysipelas, diseases introduced into the wound by the dust in the air, by the dressings, or even by the surgeon's hands; preventable diseases, but which were to the surgeon of the day a mystery he could not solve, and before which he was impotent.

During his experiments and researches with ferments the idea was constantly present in Pasteur's mind that contagious diseases were probably due to the virus ferments, that is, the ferments of poisonous substances which invade the body of animal or man as infinitely small organic beings and then multiply and gradually disorganise the living tissues. He was slow to accept these flashes of insight unless he could obtain positive proof of his beliefs, but the hope of being able to relieve the suffering of mankind by such proof urged him to yet greater effort, to patient, untiring energy and work. The death of his children, the loss of the many brave young heroes in the ambulance tents during the war, the epidemics he had witnessed, all this human suffering weighed upon him and determined him to do his utmost to solve the problems which medical men, working alone, seemed unable to fathom;

but he was met with a torrent of abuse and opposition. The doctors of the day, with a few notable exceptions, resented the invasion of what they considered their special domain, by a mere chemist, who tried to explain matters they did not understand by experimental proof. Pasteur was anxious to possess the status which would allow him to speak with greater authority on medical matters, and he accepted in 1873 the post of Free Associate of the Academy of Medicine, which enabled him to attend the meetings, which he faithfully did for many years. His associates were men mostly opposed to his doctrines, men who vigorously denounced in grandiloquent speeches the theory of bacterial origin, men who would not or could not open their eyes to what experimental research was bringing to light. But Pasteur, invariably patient when ignorance did not arise from prejudice, denounced those speakers who clung so tenaciously to worn-out theories. "The relationship is certain, indisputable," he cried, "between the disease and the presence of organisms."

At the same time it is delightful to read of Pasteur's wonderful modesty and self-depreciation, which was absolutely genuine. In one of his speeches at the Academy he exclaimed:—

"I say it here with no sham modesty; I have always considered that my only right to a seat in this place is that given me by your great kindness, for I have no medical or veterinary knowledge. I therefore consider that I must be more scrupulously exact than anyone else in the experiments which I have the honour to report to you; I should promptly lose all credit if I brought you erroneous or merely doubtful facts. If ever I am mistaken, a thing which may happen to the most scrupulous, it is because my good faith has been greatly surprised. On the other hand, I have come amongst you with a programme to follow which demands accuracy at every step. I can tell you my programme in two words, I have sought for 20 years, and I am still seeking, spontaneous generation, properly so called. If God permit, I shall seek for 20 years and more the spontaneous generation of transmissible diseases. In these difficult researches, whilst sternly deprecating frivolous contradiction, I only feel esteem and gratitude towards those who may warn me if I should be in error."

But although he had many opponents, he had also many faithful and devoted followers, the greatest scientists in England,

Russia, Germany, and France, besides young students, who flocked to the Academy of Medicine every week, in the hope of hearing Pasteur deliver some communication "which," as one of them wrote, "resolves each difficulty by an easily interpreted experiment, delightful to the mind, and at the same time so incisive that it is as satisfying as a geometrical demonstration, and gives an impression of security." These at least realized that the coming science of hospitals was to be found in the chemist's laboratory.

Can you realize, I wonder, what strides medicine and surgery have made since those dark days, 30 or more years ago? One hundred and fifty years ago there was a great belief in cauterizing wounds by fire, boiling liquids and disinfecting substances, and there was a belief, not founded on any scientific fact, that wounds should be kept from air and not touched by hands or instruments; but these customs were supplanted in the 19th century by poultices, dressings consisting of old linen, and endless ointments. An occasional voice of protest was raised, but no one saw the reason for cleanliness, and the death-rate increased, the mortality after amputations in 1868 in France being over 60 per cent. A well-known surgeon at the Charité Hospital in Paris, speaking to his pupils, said that "when an amputation seems necessary think ten times about it, for too often when we decide upon an operation we sign the patient's death warrant." But the danger to which wounds were exposed, not only by impurities in the air, but also by dirty hands, impure water, and dressings allowed to lie about on dirty tables, etc., had at that time not occurred to the average surgeon of the day. He wore his dirtiest coat, stained with blood and matter in the operating room. It is primarily due to Pasteur's discovery of organic germs in the air and in every kind of unsterilised article that modern surgery owes its success. Lister, our great countryman, was the first to apply this knowledge and to revolutionize surgery. Let me here quote a letter written by Lister to Pasteur, where he modestly passes on to the French scientist the praise given to him:—

"My dear Sir,—Allow me to beg your acceptance of a pamphlet containing an account of some investigations into the subject which you have done so much to elucidate, the germ theory of fermentative changes. I flatter myself that you may read with some interest what I have written on the



organisms which you were the first to describe in your works. I do not know whether the records of British surgery ever meet your eye. If so, you will have seen, from time to time, notices of the antiseptic system of treatment, which I have been labouring at for the last nine years to bring to perfection. Allow me to take this opportunity to tender you my most cordial thanks for having, by your brilliant researches, demonstrated to me the truth of the germ theory of putrefaction, and thus furnished me with the principle upon which alone the antiseptic system can be carried out. Should you at any time visit Edinburgh, it would, I believe, give you sincere gratification to see at our hospital how largely mankind is being benefited by your labours. I need hardly add that it would afford me the highest gratification to show you how greatly surgery is indebted to you. Forgive the freedom with which a common love of science inspires me, and believe me, with profound respect,—Yours very sincerely, Joseph Lister."

Professor Tyndall, writing to Pasteur a little later, says :—

"For the first time in the history of science we have the right to cherish the sure and certain hope that, as regards epidemic diseases, medicine will soon be delivered from quackery and placed on a real scientific basis. When that day arrives humanity, in my opinion, will know how to recognise that it is to you that will be due the largest share of her gratitude."

Even before the war Tyndall had called attention to Lister's success, but in France, and even in England, Lister's teaching had mostly fallen on deaf ears, and it was long before his methods were universally approved and adopted.

But what is the result of their adoption, of the teaching of these two great men? Operations formerly undertaken as a last resource and almost with a certainty of death are now looked upon as being of slight risk, and the death rate has fallen considerably; big operations, which formerly could never have been attempted, for they would inevitably have ended fatally, are now done daily, and hundreds of thousands of useful lives, formerly sacrificed to ignorance, are snatched from suffering and disease and put back to fulfil their destiny in the world. Can any word of ours ever express the gratitude we owe to such men?

The National Assembly voted an annuity of £480 for the

benefit of Pasteur, and Paul Bert, a member, wrote concerning it :—

“Such an assurance of gratitude, given by a nation to men who have made it richer and more illustrious, honours it at least as much as it does them.” He then enumerated Pasteur’s discoveries, and stated how they had enriched his country, without, as he said, retaining the least share of it himself, “Pasteur’s discoveries,” he continued, “after throwing a new light on the obscure question of fermentations and of the mode of appearance of microscopic beings, have revolutionized certain branches of industry, of agriculture, and of pathology.”

Our great physiologist, Professor Huxley, once said that “Pasteur’s discoveries alone would suffice to cover the war indemnity of £200,000,000 paid by France to Germany in 1871.”

Some of his friends now advised him to retire from work and take care of his health, which had always given him trouble since his illness, but to Pasteur life meant work, and he would as soon have contemplated giving up the one as the other. Greater victories in the fields of science were in store for him, and, fortunately for humanity, many years still rich in work.

In 1877 we find Pasteur at a new and laborious work. The agriculture of France was being ruined by constantly recurring and increasing epidemics of anthrax, flocks of sheep, besides cows and horses, being decimated, and in some parts of the country 20 to 50 per cent. of the sheep succumbed. At times it appeared to be stamped out, and then it would break out afresh, killing those attacked in a few hours, and resisting every treatment. Some special fields and neighbourhoods appeared to harbour the infection, but how the disease arose and how it could be checked defied the researches of the veterinary authorities and medical experts. Even human beings were attacked, the smallest scratch appearing to be an open door through which the disease could enter. In Russia it was even worse, for there 56,000 head of cattle died in two years.

Forty years earlier certain little rod-like bodies in the blood of those dying from anthrax had been pointed out, and Pasteur had devoted much attention to the subject. Dr. Davaine,

after studying Pasteur's works on ferments, asked himself whether these little bodies might not act as ferments and be the cause of the disease. Others disputed this.

At last Pasteur attacked the subject. He took a drop of the blood of an animal which had died from anthrax, and made a culture of it, that is, he laid it on some medium, broth or yeast water, suitable to the development of the rod-like bodies, or bacteria. After a few hours these bacteria had increased and multiplied enormously. A drop from this tube of broth was put into another tube, and from this a drop was placed in yet another tube, and so on till the hundredth culture had been reached. An animal, into which a few drops of this hundredth culture were injected, died as inevitably from anthrax as if those drops came direct from an anthrax victim. It was thereby proved that the bacteria which had multiplied in each culture were the cause of the disease. Besides this, the microscope revealed the fact that within a few hours of placing a drop containing the bacteria into the broth medium the bacteria could be seen which again reproduced themselves, and Pasteur reported that "one single bacterium in the drop which is sown multiplies during the following hours, and ends by filling the whole liquid with such a thickness of bacteria that, to the naked eye, it seems as if carded cotton had been mixed with the broth."

Mr. Chamberland, his associate in this work, added: "By his admirable process of culture outside the organism, Pasteur shows that the rods which exist in the blood, and for which he has preserved the name of bacteria, are living beings capable of being indefinitely reproduced in appropriate liquids, after the manner of a plant multiplied by successive cuttings. The bacterium does not reproduce itself only under the filamentous form, but also through spores or germs, after the manner of many plants which present two modes of reproduction, by cuttings and by seeds."

By these discoveries, by, as Tyndall puts it, "his extraordinary faculty of combining facts with the reasons of those facts," Pasteur foresaw the day when all contagious diseases would be analysed as anthrax was analysed, and that methods would be found for destroying the power of all destructive bacteria, or microbes, as they now came to be called. A presentiment of the greatness of such a discovery fired Pasteur



to new and renewed energy and work. The thought was at that time always present with him that humanity might be saved from endless suffering by the knowledge of its infinitely small foes. "It is terrifying," he said in a lecture, "to think that life may be at the mercy of the multiplication of those infinitesimally small creatures; it is also consoling to hope that science will not always remain powerless before such enemies, since it is already now able to inform us that the simple contact of air is sometimes sufficient to destroy them."

Having completed the preliminary studies in his laboratory, Pasteur started for some of the most afflicted parts of France where anthrax had made great ravages. In Beauce alone, where he went, the loss in some years was said to have amounted to £800,000. Pasteur had several assistants working with him, and one of them, Dr. Roux, gives this account of their work:—

"Our guide was M. Boutet, who had unrivalled knowledge of the anthrax country, and we sometimes met M. Toussaint, who was studying the same subject as we were. We have kept a pleasant memory of that campaign against anthrax in the Chartres neighbourhood. Early in the morning we would visit the sheep-folds scattered on the wide plateau of the Beauce, dazzling in the splendour of the August sunshine; then the dead sheep were examined in M. Rabourdain's knacker's yard, or in the farmyard. In the afternoon we edited our experiment note-book, wrote to Pasteur and arranged for new experiments. The day was well filled, and how interesting and healthy was bacteriology practised in the open air.

"On the days when Pasteur came to Chartres we did not linger over our lunch at the hotel, we drove over to St. Germain, where M. Manouri had kindly put his farm and flocks at our disposal. During the drive we talked of the week's work and of what remained to be done. As soon as Pasteur left the carriage he hurried to the fold. Standing motionless by the gate he would gaze at the lots which were being experimented upon with a careful attention which nothing escaped; he would spend hours watching one sheep which seemed to him to be sickening. We had to remind him of the time and to point out to him that the towers

of Chartres Cathedral were beginning to disappear in the falling darkness before we could prevail upon him to come away. He questioned farmers and their servants, giving much credit to the opinions of shepherds, who, on account of their solitary life, give their whole attention to their flocks, and often become sagacious observers."

One experiment, among others, was to make certain how the infection entered the body of the animal. Some anthrax spores were scattered upon hay given to certain sheep. The hay was eaten, but no anthrax followed. Pasteur then mixed with another lot of hay some prickly plants, such as thistles, capable of pricking the mouth or throat of the animal. This time, after the anthrax had been added, several of the animals contracted the disease, and Pasteur now had the proof that the bacteria entered the blood directly and were not absorbed by the stomach. The infected blood of an animal which has died from anthrax, entering a scratch or cut in the hand of a man will infect him. In countries where anthrax is prevalent he could now warn farmers against allowing thistles or other prickly plants to grow on the land. "It will also be necessary," said Pasteur, "to avoid all probable diffusion of anthrax germs through the carcases of animals dying from that disease, for it is likely that the department of Eure-et-Loire contains those germs in greater quantities than the other departments, anthrax having long been established there. It always goes on, dead animals not being disposed of so as to destroy all germs of ulterior contagion." The animals which had died from anthrax were often buried in the fields where they had succumbed, and Pasteur was puzzled to find an explanation of the fact that the infection appeared to haunt these fields. He was convinced that this was due to the buried animals, the bacteria still alive within them and in the soil around them, for he had proved that the spores found in the graves ten or twelve years after death were still active and virulent.

But how did the bacteria return to the surface and re-infect the living animals grazing on it? The solution of this mystery is so well described by his excellent biographer, Vallery-Radot (from whose work most of this lecture has been abstracted), that I cannot do better than repeat it:—

"One day in one of his habitual excursions with Messrs.

Roux and Chamberland to the farm of St. Germain, near Chartres, he suddenly perceived an answer to the enigma. In a field recently harvested he noticed a place where the colour of the soil differed a little from the neighbouring earth. He questioned M. Manouri, the proprietor of the farm, who answered that sheep dead from anthrax had been buried there the preceding year. Pasteur drew near and was interested by the masses of little earth cylinders, those little twists which earth worms deposit on the ground. Might that be, he wondered, the explanation of the origin of the germs which reappear on the surface? Might not the worms returning from their subterranean journey, in the immediate neighbourhood of graves, bring back with them anthrax spores and thus scatter the germs so exhumed? That would, again, be a singular revelation, unexpected, but quite simple, due to the germ theory. He wasted no time in dreaming of the possibilities opened by that preconceived idea, but, with his usual impatience to get at the truth, decided to proceed to experiment."

On his return to Paris, Pasteur spoke to Bouiley of the part of germ carriers possibly played by earth worms, and Bouiley obtained some worms which had appeared on the surface of pits where animals dead from anthrax had been buried some years before. Bouiley was invited to come to the laboratory to see the bodies of these worms opened; anthrax spores were found in the earth cylinders which filled their intestinal tube. "At three different times, within these two years," Pasteur announced to the Academy, "the surface soil of those same pits has presented anthrax spores." "This fact has been confirmed by recent experiments on the soil of the Beauce farm; particles of earth from other parts of the field had no power of provoking anthrax."

Having proved all this, Pasteur now experimented for long weeks, with endless tests and constant patience, to find a vaccine by which he might vaccinate animals against anthrax. It was found that the bacteria could no longer be cultivated at a temperature of  $113^{\circ}$  F. At a temperature of  $108^{\circ}$  they could still be cultivated, but the spores did not develop. "At that extreme temperature," Mr. Chamberland explains, "the bacteria still live and produce themselves, but they have never given any germs. Thenceforth when trying the viru-



lence of the phials of six, eight, ten, or fifteen days, we have found exactly the same phenomena as for chicken cholera. After eight days, for instance, our culture, which originally killed ten sheep out of ten, only kills four or five ; after ten or twelve days it does not kill any ; it merely communicates to animals a benign malady which preserves them from the deadly form."

In this manner vaccine was prepared and sent to all parts of the world. "What therefore is easier," said Pasteur, "than to find in these successive poisons virus capable of giving anthrax to sheep, cows, and horses without making them perish, and assuring them of ulterior immunity from the deadly disease. We have practised that operation on sheep with the greatest success. When the season comes for sheep folding in Beauce we will apply it on a large scale." This was done. Sheep were vaccinated and afterwards resisted all attempts to give them anthrax, while others, unvaccinated, succumbed every time.

Every kind of experiment and test was tried, the new vaccine triumphed everywhere. Once more Pasteur had benefited his country and all agriculture past all computation.

But it was not without bitterness that Pasteur had carried on his investigations. In the preaching of his new doctrines he had had formerly to encounter the opposition of the doctors of the day, now it was the veterinary surgeons who rose up and denounced him. Pasteur never objected to faithful criticism. "Do repeat to me every criticism you hear," he once wrote to a friend, "I much prefer that to praise, which is barren unless encouragement is wanted, which is certainly not my case. I have a lasting provision of faith and fire." And again, "Worship the spirit of criticism. It is indeed a hard task, when you believe you have found an important scientific fact, and are feverishly anxious to publish it, to constrain yourself for days, weeks, years sometimes, to fight with yourself, to try and ruin your own experiments, and only to proclaim your discovery after having exhausted all contrary hypothesis. But when, after so many efforts, you have at last arrived at a certainty, your joy is one of the greatest which can be felt by a human soul, and the thought that you have contributed to the honour of your country renders that joy still deeper."

It was only when accused of bad faith in his work, when his word was doubted, or when opposition arose from obstinacy, that his wrath was roused and he crushed his opponents with the strength and certainty of his convictions.

It was during this time that Pasteur became interested in the question of the high mortality among women after childbirth. It was a terrible fact that the poor women of Paris looked upon the Maternity Hospital at that time as the ante-room to death. When we read of 64 deaths after 347 confinements, we can only wonder how any poor creature could be persuaded to enter its doors. Various theories were propounded as to the cause of this high mortality, but nothing was proved. Things were better in Edinburgh, where Lister had introduced antiseptic treatment of these cases, and other countries had imitated his example with success. Pasteur now discovered the microbe of infection, and armed with this knowledge he attended a discussion on the subject at the Academy of Medicine.

Various causes for the frequency of puerperal fever were suggested, but Pasteur would have none of them. "None of these things cause the epidemics," he interrupted, "it is the nursing and medical staff who carry the microbe from an infected woman to a healthy one." And as the orator replied that he feared that the microbe would never be found, Pasteur went to the black-board and drew a diagram of the chain-like organism, saying: "There, that is what it is like."

"Chamberland and I assisted him in those studies," writes M. Roux. "It was to the Maternity that we went most frequently, taking our culture tubes and sterilised pipettes into the wards or operating theatre. No one knows what feelings of repulsion Pasteur had to overcome before visiting patients, and witnessing post-mortem examinations. His sensibility was extreme, and he suffered morally and physically from the pains of others. The cut of the lancet opening an abscess made him wince as if he himself had received it. The sight of corpses, the sad business of examining them, caused him a real disgust; we have often seen him go home ill from the operating theatres. But his love of science, his desire of truth were the stronger; he returned the next day."

Pasteur set himself vigorously to introduce reforms, insisting upon perfect cleanliness, making others understand, as

he did, the danger of personal infection. Within ten years the death rate at the Maternity Hospitals of Paris had fallen from between 100 to 200 per 1,000 to 3 and afterwards to 1 per thousand. It is to-day only 2 per 10,000.

But as soon as one difficulty was overcome another question arose to which he turned, always full of an enthusiastic desire to help to lighten the darkness of ignorance.

Before he had completed his research on anthrax, or even contemplated the possibility of a prophylactic vaccine, Toussaint, a veterinary professor, sent to him, in 1880, the head of a cock which had died of chicken cholera, which is a disease that occasionally attacks the farmyard and destroys hundreds of fowls. Pasteur describes the symptoms thus: "The animal suffering from this disease is powerless, staggering, its wings droop and its bristling feathers give it the shape of a ball; an irresistible somnolence overpowers it. If its eyes are made to open, it seems to awake from a deep sleep, and death frequently supervenes after a dumb agony, before the animal has stirred from its place; sometimes there is a faint fluttering of the wings for a few seconds."

Others had already recognised in the blood of birds which had died from this disease the specific microbe. Pasteur found a suitable medium for its cultivation and wrote of it: "The facility of multiplication of the micro-organisms in the culture medium is really prodigious. In a few hours the most limpid broth becomes turgid and is found to be full of little particles of an extreme slenderness. Within a few days those beings, already so small, change into a multitude of specks so much smaller, that the culture liquid, which had at first become turgid, becomes nearly clear again, the specks being so minute as to be incapable of measurement, even approximately."

The flasks containing the cultures were generally used for experimental purposes within a few hours of their preparation, but it so happened that some of these flasks were overlooked, and when hens were inoculated with these forgotten cultures (then some weeks old) it was found that, although the hens sickened, they eventually recovered from the disease. These same hens were then inoculated with fresh cultures, but they all resisted the disease. Pasteur at once realized that by this most fortunate chance a great discovery had been made. It was proved that the oxygen in the air had attenuated



the cultures, that though the microbe could still be cultivated its virulence had so abated that it did not produce death in the host. At the same time hens which had received one such attenuated inoculation were no longer susceptible to the poison, they had acquired immunity. This discovery caused him later to search for the vaccine against anthrax, and opened his mind to the possibility of discovering a vaccine for each of the diseases that mankind suffer from.

In 1881 Pasteur was invited to attend the International Medical Congress in London to represent France. I saw him at the big inaugural meeting in St. James's Hall. The place was filled to overflowing. He was asked to sit on the platform with the most distinguished guests, and as he walked up the staircase he was recognised. At once a perfect storm of applause greeted him, the huge audience of medical men and scientists rose to their feet and cheered continuously for several minutes. He turned to Sir James Paget, the President of the Congress, saying uneasily: "I am afraid I have come late; all this, no doubt, is for the Prince of Wales." "No," said Sir James with his kind smile, "it is you they are all cheering."

"I felt very proud," he wrote to his wife, "not for myself—you know how little I care for triumph—but for my country, in seeing that I was specially distinguished among the immense concourse of foreigners, especially the Germans, who are here in much greater numbers than the French."

As far back as 1880 Pasteur had devoted some attention to hydrophobia. The older members of the community may still remember the occasional appearance of this horrible disease in England, although we have never been the victims of such constant and serious outbreaks as our neighbours on the Continent. Our island gives us some immunity, and has now made it possible, through the determination of Mr. Walter Long, lately President of the Local Government Board, to stamp it out entirely. This cannot be done in countries where re-infection may at any moment take place from the frontiers. There hydrophobia is still an illness much to be dreaded. It is directly infectious, that is, the infection can always be traced from a bite or tear from an infected animal, the poison being present in the saliva and entering directly into the blood of the person attacked. This poison may, however,

linger for many weeks or months in some part of the body before it reaches the nervous centres where the disease develops, and this accounts for the fact that the incubation period varies widely, and is, in some cases, so very long. When the typical hydrophobia symptoms have developed, however, it is a terrible disease to witness. First come spasms, restlessness, and burning thirst which cannot be assuaged because the very sight or sound of water causes in the unfortunate patient strangling spasms in his throat, then follow violence and delirium, and after a day or two the patient dies from exhaustion. Up to 25 years ago we were utterly helpless to avert this dreadful suffering; the victim of a bite from a rabid dog saw death in its most horrible shape staring him inevitably in the face. In old days the fear of hydrophobia was so great that cases are known of people with rabies, or even suspected of rabies, being shot, strangled, or suffocated like wild beasts.

Once more Pasteur came to our rescue. He had tried in vain to discover the specific microbe of the disease, which appeared to be invisible to human sight, but when he found that this seemed an impossible task he tried another means of combating the enemy. He thought that preventive medicine might step in during "the long period of incubation of hydrophobia, by attempting to establish during the interval before the appearance of the first rabid symptoms a refractory condition in the subject bitten."

Until he took up the study of the disease it was not known where the seat of it lay, and this seemed to Pasteur the first problem to solve. He inoculated into rabbits saliva taken from rabid dogs, but the incubation period was very long and the result was not always positive. He then tried inoculating the rabid blood into animals, but this had no result at all. "We must try other experiments," he said. He finally came to the conclusion that the seat of the disease was in the nervous system. "The seat of the rabid virus," wrote Pasteur, "is therefore not in the saliva only, the brain contains it in a degree of virulence at least equal to that of the saliva of rabid animals."

Trephining under anæsthetics, followed by inoculation of the virus, was performed on dogs, with the result that in every case hydrophobia invariably occurred in a very short time.

Pasteur had not been able to find the microbe, but he now knew definitely where it flourished. I cannot do better than describe the next experiment in the words of Vallery-Radot, translated by Mr. Devonshire:—

“As soon as a trephined and inoculated rabbit died paralysed, a little of his rabid medulla was inoculated into another; each inoculation succeeded another, and the time of incubation became shorter and shorter, until, after 100 uninterrupted inoculations, it came to be reduced to seven days. But the virus, having reached this degree, the virulence of which was found to be greater than that of the virus of dogs made rabid by an accidental bite, now became fixed; Pasteur had mastered it. He could predict the exact time when death should occur in each of the inoculated animals. His predictions were verified with surprising accuracy. Pasteur was not yet satisfied with this. He now wished to decrease the degrees of virulence; when the attenuation of the virus was once conquered it might be hoped that dogs could be made refractory to rabies. Pasteur abstracted a fragment of the medulla from a rabbit which had just died of rabies after an inoculation of the fixed virus; this fragment was suspended by a thread in a sterilised bottle, the air in which was kept dry by some pieces of caustic potash lying at the bottom of the vessel, which was closed by a cotton-wool plug to prevent the entrance of atmospheric dust. The temperature of the room where this desiccation took place was maintained at  $23^{\circ}$  C. As the medulla gradually became dry its virulence decreased, until at the end of 14 days it had become absolutely extinguished. This now inactive medulla was crushed and mixed with pure water, and injected under the skin of some dogs. The next day they were inoculated with medulla which had been desiccated for 13 days, and so on, using increased virulence until the medulla was used from a rabbit dead the same day. These dogs might now be bitten by rabid dogs given them as companions for a few minutes, or even submitted to the intracranial inoculations of the deadly virus, they resisted both.”

Having proved these points to his own satisfaction, Pasteur asked the Minister of Public Instruction to appoint a Commission to verify his facts, and this was done. The carcase of a dog which had died from rabies was opened and a fragment of medulla was mixed with sterilised broth. Two dogs which had



been previously vaccinated by Pasteur's method were present, also two others which had not been vaccinated, and two rabbits. All these animals were now inoculated with the broth. "M. Pasteur tells us," wrote a reporter present, "that, considering the nature of the virus used, the rabbits and the new dogs will develop rabies within 12 or 15 days, and that the two protected dogs will not develop it at all, however long they may be detained under observation."

The prophecy was accurately verified. Whenever a dog had been vaccinated he resisted every effort of infection, neither the bites of rabid animals nor direct intracranial injection of the virus produced any symptom of hydrophobia.

The Commission recommended the construction of large kennels where further experiments might be made, and where the question might be solved, whether inoculation of the vaccine was effectual in cases where the dog had already been bitten by a rabid animal. "What I want," wrote Pasteur, "is to obtain prophylaxis of rabies *after* a bite." It was impracticable to consider the possibility of vaccinating every dog in France against a possible infection, and yet, unless dogs could be made harmless, there was always the possibility of a man being fatally bitten.

He recommended the following experiment to his assistant :—"When there is a good biting dog, have a pair of our dogs bitten, after which you will treat one of them so as to make him refractory (carefully taking note of the time elapsed between the bites and the beginning of the treatment). Mind you keep notes of every new experiment undertaken." "But even when," he writes elsewhere, "I shall have multiplied examples of the prophylaxis of rabies in dogs, I think my hand will tremble when I go on to mankind."

His researches were successful, and in March 1885 he writes to a friend :—"I have some new experiments on rabies on hand, which will take some months. I am demonstrating this year that dogs can be vaccinated or made refractory to rabies *after* they have been bitten by mad dogs. I have not yet dared to treat human beings after bites from rabid dogs, but the time is not far off, and I am much inclined to begin on myself, inoculating myself with rabies and then arresting the consequences, for I am beginning to feel very sure of my results."

By the middle of 1885 the kennels at Villeneuve were ready for the reception of 60 dogs, besides other animals used for experiments, and Pasteur had some rooms prepared for his own use, where he could spend days and nights near his researches. Although he was slowly becoming convinced that the vaccine, so successful in preventing rabies in animals that had been bitten by other rabid animals, could be used as advantageously on man, he still hesitated to take this decisive step.

But one summer day in 1885 an Alsatian woman entered his laboratory holding her little son, Joseph Meister, by the hand. Two days before, this little fellow had been walking alone to school when he was attacked by a mad dog, thrown to the ground and repeatedly bitten. A man had come to his rescue, and had beaten off the dog, which ran back to his master whom he bit in the arm before he was shot. The boy's parents consulted a doctor, who wisely advised them to lose no time in taking the child to one who was not a doctor but who could help them better than anyone else. The dog's master came also, but as the dog's teeth had not pierced his clothes Pasteur at once reassured him and sent him home. But what about the boy? Pasteur had to face the alternative, either to try the treatment, so far only tried on animals, or to leave the child to his horrible and inevitable fate. There was no third course. The child's suffering affected Pasteur very much. The little fellow had 14 wounds, many of them very deep, and Pasteur arranged at once for comfortable quarters for him and his mother, telling them to return a few hours later. He consulted with two of his assistants, wise men of experience, and they agreed that it was his obvious duty to vaccinate the boy at once. The first inoculation was made that evening; a few drops of the liquid were injected with a syringe into the patient's side, and the boy hardly felt it. "All is going well," wrote Pasteur a few days later, "the child sleeps well, has a good appetite and the inoculated matter is absorbed into the system from one day to another without leaving a trace. It is true that I have not yet come to the test inoculations. If the lad keeps well during the three following weeks I think the experiment will be safe to succeed." His anxiety was intense. At night he could not sleep thinking always of the little boy, of whom he had

become very fond, dying from hydrophobia, if the treatment were after all in vain. By day he could fix his mind on no work, all his thoughts were with the child. The strain became greater as the inoculations increased in intensity, and after the twelfth dose, the strongest, he had days of anxious waiting to see which would triumph, the original poison or the vaccine. Pasteur was persuaded to leave the boy under observation in Paris and to take a rest in the country, but even there the hourly fear of receiving bad news by telegram was almost too much for him. But the bad news never came. Instead he was able to write in August, "Very good news last night of the bitten boy. I am looking forward with great hopes to the time when I can draw up a conclusion. It will be 31 days to-morrow since he was bitten."

Pasteur's sympathy with suffering was so great that it needed all his love of science, all his convictions that only by experiments could he hope for certain knowledge to enable him to perform the simplest operation on any animal. He admitted that he never could have had the courage to shoot a bird for sport.

It was now found necessary to prepare for the reception of patients who had been bitten by mad dogs, for the case of little Meister had created a great sensation. Here is Pasteur's second case, reported by Vallery-Radot :—

"The Mayor of Farlay wrote to him that, on October 14, a shepherd had been cruelly bitten by a rabid dog.

Six little shepherd boys were watching over their sheep in a meadow; when they suddenly saw a large dog passing along the road with hanging, foaming jaw. "'A mad dog!' they cried. The dog, seeing the children, left the road and charged them; they ran away shrieking, but the eldest of them, Jupille, 14 years of age, bravely turned back in order to protect the flight of his comrades. Armed with his whip, he confronted the infuriated animal, which flew at him and seized his left hand. Jupille, wrestling with the dog, succeeded in kneeling on him, and forced its jaws open in order to disengage his left hand; in so doing, his right hand was seriously bitten in its turn; finally, having been able to get hold of the animal by the neck, Jupille called to his little brother to pick up his whip, which had fallen



during the struggle, and securely fastened the dog's jaws with the lash. He then took off his wooden shoe, with which he battered the dog's head, after which, in order to be sure that it could do no further harm, he dragged the body down to a little stream in the meadow and held the head under water for several minutes. Death being now certain, and all danger removed from his comrades, Jupille returned home. Whilst the boy's wounds were being bandaged the dog's carcase was fetched, and a necropsy took place the next day. The two veterinary surgeons who examined the body had not the slightest hesitation in declaring that the dog was rabid. The Mayor, who had been to see Pasteur during the summer, wrote to tell him that this lad would die a victim to his own courage unless the new treatment intervened. The answer came immediately: Pasteur declared that, after five years' study, he had succeeded in making dogs refractory to rabies, even six or eight days after being bitten; that he had only once as yet applied his method to a human being, but that once with success, in the case of little Meister, and that, if Jupille's family consented, the boy might be sent to him. 'I shall keep him near me in a room in my laboratory; he will be watched and need not stay in bed; he will merely receive a daily prick, not more painful than a pin-prick.' The family, on hearing this letter, came to an immediate decision; but between the day when he was bitten and Jupille's arrival in Paris six whole days had elapsed. Yet, however great were Pasteur's fears for the life of this tall lad, who seemed quite surprised when he was congratulated on his courageous conduct, they were not what they had been in the first instance—he felt much greater confidence."

It is a pleasure to think that the life of this brave young shepherd was saved.

Physicians who wished to study his methods, besides people who had been bitten, now came from all sides and all countries, and Pasteur and his assistants had their hands full. He took the deepest personal interest in his patients, comforting, helping, administering to all their wants. There were many poor people amongst them, peasants from far-away villages, who came hundreds of miles for this wonderful treatment, and he saw to it that they were properly housed and

cared for. Children appealed to him most, and he could never be reconciled to their sufferings. Among his earlier cases there was one, a little girl of ten, who had been terribly bitten on the head 37 days before she was brought up for treatment. He realized at once that the case was hopeless and that the child was doomed, and he was very loth to try the treatment at all, for, he argued, the issue was almost sure to be fatal, and in that case others under treatment would lose their faith, and those who had not yet come, might hear of it and refuse to be vaccinated. But the parents so begged him to try to save their child that he consented. She was inoculated and returned home, but some weeks later the inevitable signs of rabies showed themselves and Pasteur was informed. He hurried to her bedside and fresh inoculations were tried, but in vain. As she became worse she begged him to stay by her and he did so, only leaving her when she was at the point of death. But in almost all cases he had the joy of seeing his patients recover and of receiving letters from all parts of the world in grateful remembrance of the care he had bestowed upon them. Here is another story told by Vallery-Radot :—

“During the early part of March, Pasteur received 19 Russians. They had been attacked by a rabid wolf and most of them had terrible wounds; one of them, a priest, had been surprised by the infuriated animal as he was going into church, his upper lip and right cheek had been torn off, his face was one gaping wound. Another, the youngest of them, had had the skin of his forehead torn off by the wolf's teeth; other bites were like knife cuts. Five of these unhappy wretches were in such a condition that they had to be carried to the hospital as soon as they arrived. The Russian doctor who had accompanied these peasants related how the wolf had wandered for two days and two nights tearing to pieces everyone he met, and how he had finally been struck down with an axe by one of those he had bitten most severely. Because of the gravity of the wounds and in order to make up for the time lost by the Russians, Pasteur decided on making two inoculations every day, one in the morning and one in the evening. The patients at the hospital were inoculated there. The fourteen others came every morning

in their fur coats and caps with their wounds bandaged, and joined without a word the motley groups waiting treatment at the laboratory—an English family, a Basque peasant, a Hungarian, etc. In the evening the dumb and resigned band of peasants came again to the laboratory door. They seemed led by fate, heedless of the struggle between life and death of which they were the prize. ‘Pasteur’ was the only French word they knew, and their set and melancholy faces brightened in his presence as with a ray of hope and gratitude. Their condition was the more alarming because a whole fortnight had elapsed between their being bitten and the date of the first inoculation. Statistics were terrifying as to the result of wolf bites, the average proportion of deaths being 82 per 100. General anxiety and excitement prevailed concerning the hapless Russians, and the news of the death of three of them produced an intense emotion. Pasteur had unceasingly continued his visits to the hospital. He was overwhelmed with grief. His confidence in his method was in nowise shaken. The general results would not allow it. But questions of statistics were of little account in his eyes when he was the witness of a misfortune, his charity was not of that kind which is exhausted by collective generalities; each individual appealed to his heart. As he passed through the wards of the hospital each patient in his bed inspired him with deep compassion. And that is why so many who only saw him pass, heard his voice, met his pitiful eyes resting on them, have preserved of him a memory such as the poor had of St. Vincent de Paul. ‘The other Russians are keeping well so far,’ declared Pasteur, and whilst certain opponents in France continued to discuss the three deaths, and apparently saw nought but those failures, the homecoming of the 16 survivors was greeted with an almost religious emotion. Other Russians before them had been saved, and the Tsar, knowing these things, desired his brother, the Grand Duke Vladimir, to bring to Pasteur an Imperial gift, the Cross of the Order of St. Anne of Russia in diamonds. He did more, he gave £4,000 in aid of the proposed Pasteur Institute.”

The plan was now generally approved to create an Institute in Paris for the preventive treatment of hydrophobia and for



research on contagious diseases. The Institute was to be called after Pasteur, and public subscriptions were invited. The enthusiastic admiration all France felt for her great scientist now became evident ; and not only France, for from Italy, German Alsatia, Turkey, and other countries contributions poured in. President Carnot opened the Institute in person in November, 1888, and Pasteur received the ovation due to him. But he was a broken and tired old man, and it was sad to see how his hard work and the opposition he had so often encountered had aged him. "Our only consolation," wrote Pasteur at about this time, "as we feel our own strength failing us, is to know that we may help those who come after us to do more and to do better than ourselves, fixing their eyes as they can on the great horizons of which we only had a glimpse." If his health was broken his spirit was not. As we become old we are a little apt to linger over the glories of our young days. People and things are not what they were ! But to a mind like Pasteur's the future was only full of promise, of the realization of dreams he had dreamt and had not had the time to mature.

Every morning he went through his hospital wards, attending to every detail of the work, seeking information about each case.

On his 70th birthday, December 27, 1892, he received a splendid reception in the great theatre of the Sorbonne, in Paris. Representatives from many foreign countries were present, as Pasteur entered, leaning on the arm of President Carnot. Many addresses were presented to him, that from England being brought by Lord Lister. "You have," said he, "raised the veil which for centuries had covered infectious diseases, you have discovered and demonstrated their microbian nature." "More fortunate than Harvey and than Jenner," said Professor Brouardel, "you have been able to see the triumph of your doctrines, and what a triumph !"

This was his last public honour. Pasteur's days were drawing to an end. He was taken ill towards the end of the following year, lingered on for some months, and died, in the midst of his family, on September 28, 1895.

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## THE RELIEF OF HEADACHES BY THE CORRECTION OF ERRORS OF REFRACTION.

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[With Plates XIII.—XVIII.]

“to . . . . end

“The” head-“ache . . . .

“That flesh is heir to, ’tis a consummation

“Devoutly . . . . wish’d”

by thousands of our patients, and aimed at even by those medical men, who most firmly hold that it is the treatment of disease which is their function—not the relief of symptoms.

But that the consummation too often is not attained is obvious; and we do not wonder, therefore, when we see our patients hurry from one doctor to another, and, finally, having tried us all in vain, betake themselves to their own treatment by means of advertised remedies. “Treatment,” they call it, but, in reality, they do not expect to be cured; they are content if their attacks of headache can be relieved temporarily by the taking of “headache powders”; and they often succeed in attaining that, though occasionally their powders are so active that their heads are for ever put out of the reach of aches altogether.

Headaches are, admittedly, even by ourselves, often beyond our power of removal. But many of the headaches which years ago patients would have been told to put up with can, now that the science and art of medicine and surgery have more advanced, be got rid of, and that without the aid of drugs, which too frequently simply give the sufferer ease by narcotising him.

Of late years it has come to be recognised that a large number of the headaches for which no disease seems to be answerable—*functional* headaches, that is, as distinguished from *organic*—have been relieved by the discovery and treatment of strain on the part of the eyes.

Of all the causes of eyestrain the most frequent is the presence of an error of refraction, and it is to the headaches which are relieved by the correction of such errors that I

propose to confine my remarks.

Every practitioner has had experience of such cases; but yet I venture to record here, briefly, some which will illustrate the benefit to be obtained by such correction.

A housemaid, of Scandinavian nationality, aged 29, complained of what she called "migraine." Her attacks of headache were frequent, beginning after dinner, and often continuing all night; and, on account of them, she had given up reading and sewing. The physician, whom she had consulted some months earlier, suspected that her eyes might be the cause of the discomfort, but for months she took medicine without any benefit. I found in each eye a small error of hypermetropic astigmatism, and no other affection of the eyes except a slight "want of balance." The astigmatism was so small in amount that I might well have hesitated to advise the wearing of the correcting glasses; but still I did advise it. Five days after the spectacles were first put on, the physician informed me that the patient said she was quite well. Two months later I saw her myself, and she reported that she had been entirely free from headaches since she began to wear the glasses, and that she sewed, read, and crocheted without discomfort.

Another case was that of a High School girl, aged 18, who, as an examination approached, for which she had been studying a year, found that she had to diminish her hours of reading, because of aching at the top of her head, which came on especially in the evening. Her visual acuity was above the standard, but there was in each eye a very small error of hypermetropic astigmatism. I advised her to wear glasses for reading, which corrected that error. In less than a fortnight she reported that she had had no headache since taking to the glasses, and that she could work again as long as before.

A trained nurse, aged 31, for six months had suffered from frontal headaches, which might be present at any time, but which sewing and reading made worse. The error she showed was a comparatively small one of shortsightedness. She acted upon my advice to wear the correcting lenses constantly, and, three months later, she said she had had no headache since she got the glasses, and could read with comfort.

Another case was that of a boy of 13 at school. His father said that the boy had suffered, for two or three months, from headaches, which were sometimes so severe as to make him cry. They were most felt towards the end of the day, though the boy was not a great reader, and was no more free from discomfort on Saturdays and Sundays than on other days. His eyes showed a small error of farsightedness, and I recommended that he should wear glasses to correct it. This he did, and six days later he said that he had been quite free from headache.

Again, a man of 25, engaged in superintending his own engineering shop, had what he called "bilious attacks," though his description of them suggested typical migraine:—about once a month, without any warning, he suddenly saw specks before his eyes, and objects about him began to move; then headache set in, followed by vomiting. Then the specks disappeared, but he remained prostrate for about 24 hours. Examination revealed an error of hypermetropic astigmatism in each eye, and I advised him to wear



the correcting lenses constantly as an experiment, for I am never particularly hopeful of relieving migraine in this way. He did not take kindly to the glasses, but I believe he wore them pretty regularly, and 14 months later he reported that he had not had a single attack since he took to them.

One more case, this time a tradesman of 40, who occasionally suffered from severe "sick headache." His vision was up to the standard, but he had a small error of hypermetropic astigmatism, and accepted the weakest ordinary astigmatic lens in each eye. The wearing of these lenses, though not constantly, sufficed to dispel the headache, from which he had suffered at intervals all his life.

I have recorded these cases, though they are such as every one who is interested in eyes is seeing frequently, because they show that headaches, occurring in any class or vocation of life, in either sex, and at any age, may be relieved by the one measure—the wearing of spectacles which correct errors of refraction which are present.

Some critics, in view of the fact that relief follows the correction of errors—so small in some cases as not to impair the power of vision—may be inclined to hold that the relief is due to "suggestion" in neurasthenic subjects. Sometimes I have been tempted to say the same myself; but against that view this is to be reckoned, that the patients whom I have enumerated—and many others—did not show any other stigmata of hysteria, which I could discern; neither, presumably, were any such stigmata observed by the physicians and surgeons who referred the patients to me, and who had themselves treated the headaches for, in some cases, months, using, I am satisfied, the most approved remedies that medicine has provided for the relief of such conditions.

I am myself convinced that it is a clinical fact that headaches may be relieved by the correction of errors of refraction—even minute errors. In this I take my stand with the modern ophthalmic surgeons, whose position is represented, in perhaps a too extreme manner, by the American school, with Dr. George M. Gould as its mouthpiece, as against the older ophthalmic surgeons, who teach that astigmatism of small amount may be ignored.<sup>21</sup>

This view, that astigmatism of less than 1 D is of no importance, was enunciated by the *Lancet*, as recently as in 1904,<sup>8</sup> on the authority of certain "London ophthalmologists," and of Donders, the discoverer "of the existence and the frequency of hypermetropia, . . . and of the frequency

of astigmatism," whose opinion is recorded in his monumental work on *Accommodation and Refraction of the Eye*.<sup>9</sup>

This counterblast by the *Lancet* to the teaching of Dr. Gould in his *Biographic Clinics*,<sup>23</sup> led to a good deal of correspondence in the medical journals about that time, and to the publication of several papers containing actual experiences; and though few British oculists, if any, go the whole way with Dr. Gould in thinking that most general ailments are to be attributed to errors of refraction, many have recorded that the correction of even minute errors of refraction has, in their own practice, relieved patients—not hysterical—of headaches.

Now, if the headaches are relieved, or even diminished, while the glasses are being worn, it is fair to reason that the glasses have led to the disappearance of something which was the cause of the headaches.

That something is usually spoken of as "strain." But why eyestrain should produce headaches is not perfectly clear, and it is probable that there are more paths than one by which the effect is reached.

For the exact explanation we have to look to physiology, but I think I may venture to put some of the data before you as succinctly as I can, and then offer an explanation.

#### OPHTHALMIC OPTICS.

To begin with, I will run over briefly the necessary rudiments of ophthalmic optics.

First of all, one must remember that rays of light proceed from any and every point in all directions (Fig. 1). Some of



Fig. 1.

the rays enter an eye which is turned towards the point from which they are proceeding. The nearer the point is to the eye, the more divergent the rays are when they reach the eye (Fig. 2); the farther away, the less divergent, so that

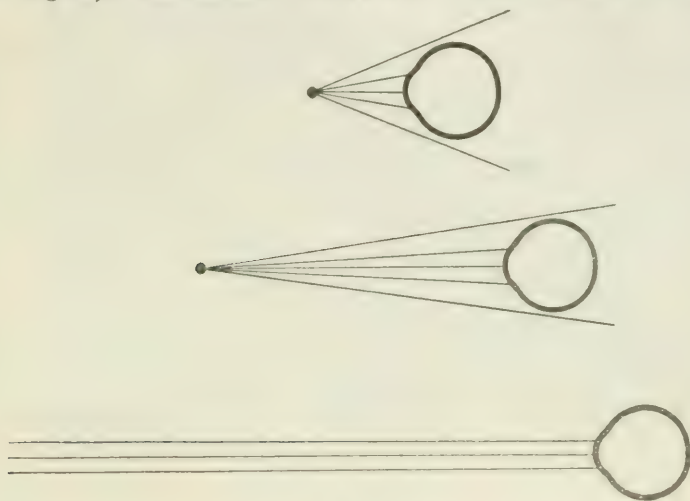


Fig. 2.

if they come from at least six metres away the divergence is so slight that the rays can be considered to be parallel (Fig. 2).

EMMETROPIA.—The rays that enter the eye, by passing through the refracting media—cornea, aqueous humour, lens, and vitreous humour—are made convergent (Fig. 3). In order

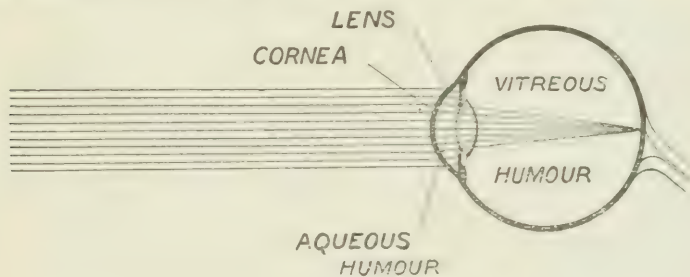


Fig. 3.

to have clear vision it is necessary that these rays be made just so convergent that they meet on the retina. The point at which they meet is called their "focus." In an emme-



tropic eye, that is, a normal eye, the refracting power of the transparent media is such that parallel rays focus on the retina; or, to put it in another way, the retina of an emmetropic eye is just so far behind the cornea that the focus of parallel rays falls on it.

AMETROPIA.—(a) *Hypermetropia and Myopia*.—If, however, the retina is not this distance behind the cornea, the eye is said to be “ametropic.” If the retina is in front of the point at which focussing occurs, that is, if the eye be shorter than an emmetropic eye, it is called a “hypermetropic” eye. If the retina is beyond the point at which focussing occurs, that is, if the eye be longer than an emmetropic eye, it is called a “brachymetropic” or “myopic” eye. In either case, instead of a clear image being produced of each point, there is produced a diffused image. And, of course, as every object and its image are made up of points, it follows that the image of an object must be diffused just as the image of each point is.

(b) *Astigmatism*.—There is, however, another form of ametropia in which the essential fault is not one of length of the eyeball, but of the curvature of the cornea.

A perfectly emmetropic eye and a simply hypermetropic or myopic eye have all the meridians of the cornea curved exactly the same, so that the cornea is, in fact, a segment of a sphere. If the meridians of the cornea are not of the same curvature, but, for example, if the meridian from above downwards is more sharply curved than that from side to side—if, that is, the curve of the cornea from above downwards is the segment of a smaller circle than that from side to side, the eye is called “astigmatic.” I am in the habit of roughly and popularly comparing the cornea of an emmetropic eye, or of a hypermetropic or myopic eye, to a segment of a ball, while, in the case of an astigmatic eye, I compare its curves to those of a man’s felt hat, in which the curve from side to side is shorter than that from before backwards.

If an eyeball has the proper length of an emmetropic eye, but has the curvature of the cornea from side to side less sharp than that from above downwards, the less acute curvature has the effect of diminishing the refractive power of the cornea in that meridian, and consequently the rays

PLATE XIII.



Fig. 5.

The characteristics of  
the two great races  
of the land portrayed  
themselves in the Ro-  
man and the Spanish  
struggle with much

Fig. 5a.

*Emmetropia.*

PLATE XIV.



Fig. 6.

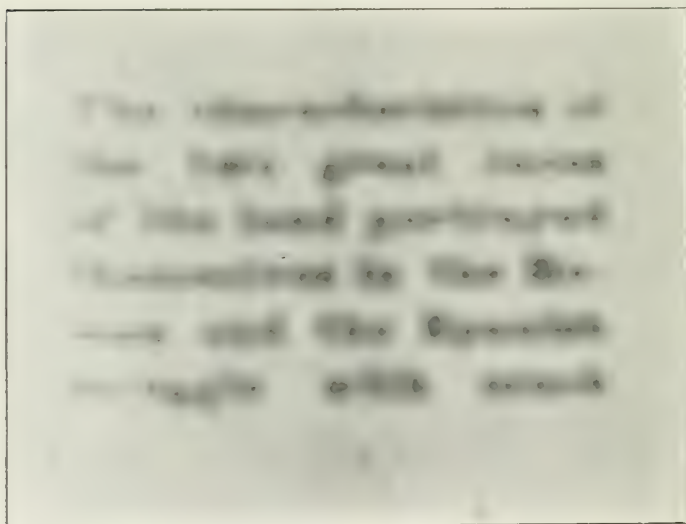


Fig. 6a.

*Hypermetropia (2 D).*



PLATE XV.



Fig. 7.

The characteristics of  
the two great races  
of the land portrayed  
themselves in the Ro-  
man and the Spanish  
struggle with much

Fig. 7a.

*Hypermetropia (1 D).*

PLATE XVI.



Fig. 8.  
*Myopia* (1 D).

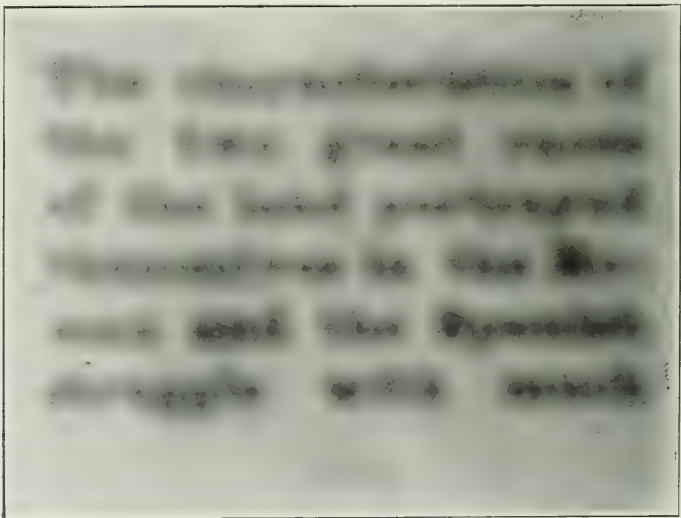


Fig. 8a.  
*Myopia* (2 D).

PLATE XVII.



Fig. 9.

The characteristics of  
the two great races  
of the land portrayed  
themselves in the Ro-  
man and the Spanish  
struggle with much

Fig. 9a.

*Simple hypermetropic astigmatism (1 D). Axis vertical.*





Fig. 10.

The characterisation of  
the two great races  
of the land portrayed  
themselves in the Ro-  
man and the Spanish  
struggle with much

Fig. 10a.

*Simple myopic astigmatism (1 D). Axis horizontal.*

that fall upon this meridian, focus, not on the retina, where the rays passing through the emmetropic meridian focus, but beyond it—as occurs in hypermetropia. This, then, is called “simple hypermetropic astigmatism.”

One could describe myopic astigmatism, compound astigmatism (hypermetropic and myopic), and mixed astigmatism (hypermetropia and myopia in the same eye) in a similar manner, but the one example is sufficient to explain the principle.

In astigmatism, then, as all the rays, if any, do not focus on the retina, the image of the object is diffused.

#### PHYSIOLOGY.

Let us consider what happens when an eye looks at a distant object.

I. DISTANT VISION.—I have had photographs done in imitation of some, which Professor Simeon Snell, of Sheffield, has reproduced in his little book on *Eyestrain*,<sup>22</sup> because they show how objects are received on the retinae of eyes which are ametropic; these photographs are illustrated in Figures 5 to 10a. They have been prepared by first focussing the objects—a view across a street, and a paragraph of printing—exactly, thus giving the picture as it appears to an emmetrope (Figures 5 and 5a), and then, by placing different lenses immediately in front of the photographic lens, producing the conditions as they exist in hypermetropia, myopia, and astigmatism. Figures 7 and 7a and 6 and 6a show the picture as it appears to a hypermetrope of 1 D and 2 D respectively (with the eyes at rest, of course); Figures 8 and 8a show it as it appears to a myope of 1 or 2 D; Figures 9 and 9a as it appears to a person with 1 D of hypermetropic astigmatism; and Figures 10 and 10a to one with 1 D of myopic astigmatism.

If the eye be emmetropic, the rays focus on the retina, and a clear image is formed, and the eye is satisfied.

If the eye is hypermetropic, the rays focus behind the retina, and on the retina there is formed a diffused—a blurred—image. If the refractive power of the eye could be increased, the rays might be focussed on to the retina. Now, there is in the eye a means by which this increase of refractive power can be brought about. The ciliary muscle, which is behind the iris and is ordinarily relaxed, though not absolutely, can contract; its contraction causes

the suspensory ligament to relax. This relaxation permits the lens, by its own elasticity, to become more spherical. And this increase in the sphericity of the lens increases its refractive power, and, if the increase is sufficient, the rays will be focussed on the retina, and a clear image be produced. In that case, as in the case of the emmetropic eye, the eye is satisfied. But observe what happens in order that this clear image may be obtained and preserved. The ciliary muscle must contract, and keep contracted. As soon as the muscle relaxes, the image becomes indistinct.

Again, if it is a myopic eye which is looking at the distant object, the rays focus in front of the retina, and, consequently, a blurred image is produced, just as in the case of a hypermetropic eye.

In order to get a clear image in a myopic eye, what is needed is a weakening of the refractive power of the eye, so that the focus may be displaced backwards. But there is no means in the eye by which this can be brought about. Contraction of the ciliary muscle only increases the difficulty. So the blurred image remains, and the myope soon learns that he must put up with indistinct vision.

If, again, the eye is an astigmatic one, there is here, also, produced a blurred image. Like the hypermetropic eye, the astigmatic eye instinctively, by contracting the ciliary muscle, strives after a clear image. Now, if the ciliary muscle were capable of irregular contraction, so that part could contract, while part remained relaxed, and the lens be influenced accordingly, then in many cases of astigmatism, as in many cases of hypermetropia, the error could be exactly overcome, and the image made clear, in which case we should have the same condition as in small errors of hypermetropia. I am doubtful, however, if the muscle can contract irregularly; but this is a point upon which difference of opinion exists, and upon which the physiologists must adjudicate. If it cannot contract irregularly, as I believe, then it follows that the image can never be made clear by muscular effort; for the difference between the foci of different meridians will remain the same, though the foci themselves may be altered in position. If the ciliary muscle, by its action, brings the focus, which is not on the retina to the retina, it will, by the same amount, remove the focus that was on the



retina an exactly equal distance behind it ; and so, the muscular action having been called forth, the result is still a blurred image. If, for example, the error be  $+ 1 D$ , and the ciliary muscle contracts so that the focus is altered  $1 D$ , the image is still indistinct (Figures 9, 9a, 10, and 10a). The eye has made a muscular effort and it has obtained nothing by it. But yet it recognises, perhaps unconsciously, that muscular action has taken place—muscular action, which it had hoped would give clear vision, as it might have done in hypermetropia,—and only when the effort has been completed does it realise its futility, and so suffers disappointment. Here, then, is another factor to be reckoned with, this time a mental factor—that of psychical disappointment and irritation at failure.<sup>20</sup>

Probably this unavailing muscular movement continues to be made, at all events in small errors of astigmatism, whenever objects are looked at, and is followed, invariably, by disappointment.

2. NEAR VISION.—a. *Accommodation*.—In near vision we have to recognise that as the object looked at is within six metres of the eye, the rays emanating from it are divergent when they reach the cornea (Fig. 2). To render divergent rays convergent, so that they may focus on the retina, it is necessary to increase the strength of the refracting media. This is done, as in the case of hypermetropia, as already described, by contraction of the ciliary muscle, and this contraction with the effect it produces upon the crystalline lens, is what is known as “accommodation.”

In emmetropia accommodation takes place, but the amount being physiological, it causes, in the absence of other disorders, no discomfort.

In hypermetropia also accommodation takes place. But as in distant vision accommodation is already taking place, this distant-vision accommodation is extra to that which is needed for near vision. So that a hypermetrope exerts his ciliary muscle more than an emmetrope does.

In myopia the condition varies according as the far-point of the eye is beyond, or at, or within, the position at which the near object is placed. In any case, however, the amount of accommodative effort is less than in either emmetropia or hypermetropia, because accommodation has to be exerted only within the far-point. If, for example, the far-point

corresponds with the position in which the object is held, there will be needed no accommodation at all. In myopia, therefore, whether accommodation is needed or not, it is, at all events, less than in emmetropia.

In astigmatism there is precisely the same condition, so far as near vision is concerned, as in eyes which are not astigmatic. Accommodative effort occurs, but the presence of the astigmatism prevents the image on the retina from being clear, just as it does in distant vision; and the same psychical irritation follows the repeated failure to obtain clear images.

*b. Convergence.*—In near vision, however, there is another muscular action besides accommodation which has to be remembered. This is "convergence" of the visual axes. When one looks at a distant object, the eyes are directed parallel to one another (Fig. 4). As the object approaches nearer, it is

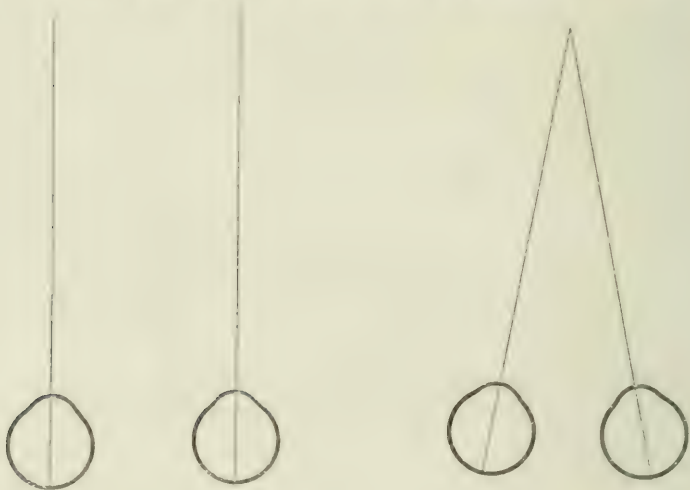


Fig. 4.

easy to see that the eyes turn towards one another, in order to keep, both of them, fixed on the object. We have already seen that it is this nearness that calls forth accommodation; so, obviously, accommodation and convergence are associated movements. The stimulus to accommodate is also the stimulus to converge. Yet the association is not rigid, for it is possible to converge without accommodating, and, conversely, it is possible to accommodate without converging. But the rule holds that accommodation goes along with convergence.

When an emmetrope looks at a near object, and accom-

modates, say, 2 D, he exerts also 2 metres of convergence. When a hypermetrope of 1 D, for example, looks at a near object, he requires to accommodate 3 D, for he was already accommodating 1 D, before he turned to the near object, which requires 2 D. He receives, therefore, a stimulus to converge through 3 metres. But that is 1 metre more than the distance of the object requires. He can, however, dissociate the two movements within certain limits, and, by making only that movement of each kind which is necessary, he sees the near object as though he were an emmetrope. But observe, he has had to dissociate two associated movements, as well as use more accommodative power. If a myope looks at the same near object, he accommodates, as we have seen, less than the emmetrope. If, for example, he has to accommodate only 1 D, instead of 2 D, the stimulus to convergence is only for 1 metre. But that does not suffice to fix both visual axes on the object; to do that he must converge through 2 metres. Therefore, a myope also has to dissociate the two associated movements, and has to exert convergence in excess of accommodation. So that a myope, though he may not need to accommodate at all, is not relieved from the necessity of muscular action—he must converge, dissociating two ordinarily associated movements. If an astigmatic person looks at the same near object, his astigmatism in itself has no effect upon convergence.

#### SUMMARY OF OPTICS AND PHYSIOLOGY.

This long and, I am afraid, tedious account may be summed up into this: that in hypermetropia, both in distant and near vision, clear vision, if it is obtained at all, is obtained by the employment of continuous and excessive action of the ciliary muscle, and by the action of convergence dissociated from accommodation; in myopia, clear near vision is obtained only with convergence in excess of accommodation; in astigmatism, clear vision is not obtained at all, though it is aimed at by repeated or continuous action of the ciliary muscle, and this inability to get clear vision leads to psychical irritation.

#### EXPLANATION OF HEADACHES.

How, then, do these conditions cause headaches? The ciliary muscle is an involuntary muscle, and it is characteristic of involuntary muscle that its activity alternates with rest—it



has rhythmicity.<sup>10</sup> The ciliary muscle is, normally, slightly contracted, and though it cannot be thrown into tetanus,<sup>12</sup> it yet can enter into a state of sustained contraction.<sup>12</sup> Sustained contraction of any muscle, unstriated as well as striated, is followed by fatigue,<sup>13</sup> which "is due to the consumption of the substances available for the supply of energy in the muscle, but more particularly to the accumulation of waste products of contraction"<sup>13</sup>; and Mosso has shown, by means of his ergograph, "that the fatigue products produced in the muscles during work cause most of their injurious effects by acting on the central nervous system and diminishing its power of sending out impulses."<sup>14</sup>

The ciliary muscle is supplied by the ciliary nerves, and these, again, come from the ciliary ganglion, which is connected, by some of its roots, with the sympathetic nervous system. It is reasonable to suppose that excessive activity of the ciliary muscle, among the fibres of which the sympathetic nerve-endings are, will be followed by irritation of the sympathetic system. And irritation of the sympathetic may give rise, as Osler<sup>15</sup> indicates, to spasm of the cerebral arteries, which "through increase of vascular tension" gives rise "to a higher velocity of flow through the cerebral capillaries," and hence results in cerebral hyperæmia or "congestion of the brain," showing itself in headache, insomnia, and other unpleasant sensations.<sup>16</sup>

These, I take it, are the actual explanation of the headaches which are associated with errors of refraction: mainly, first, irritation of the sympathetic in the ciliary muscle producing congestion of the brain, and, in less degree, the disturbance caused by the necessity of dissociating two associated movements, and the irritation resulting from the inability, in spite of repeated efforts, to obtain clear images on the retina.

If this be the explanation, one might think that headache would be present in every person having such an error, and would be always present. Yet some ametropes never suffer from headache.

One class of such ametropes consists of those whose error is very large—so large indeed that, though it may be simple hypermetropia, the fullest contraction of the ciliary muscle is not sufficient to focus rays upon the retina. Hence, whatever the person can do, he always has indistinct vision.

And so he resigns himself to the inevitable, and, recognising that his muscular efforts are fruitless, refuses to make them. He, therefore, has no headache, but he has no clear vision.

Another class of ametropes who do not suffer from headache are those who do not use their eyes for anything that requires exact observation; this is probably the reason that it is amongst the indoor-workers—dressmakers and clerks, students and teachers,—that we find the headaches, rather than amongst the outdoor-workers—farm labourers, carters, and domestic servants who do not have sewing as part of their duties.

In this connection, too, one understands why the American insists upon the correction of errors of refraction even more than the Englishman, and why the Englishman insists more than the Continental.<sup>11</sup> For in the States, life seems to be more strenuous than in England, while the Continental, though his hours of work are long, works much more leisurely.

And then one must remember that other conditions have to be considered—conditions, mainly, of the general health, and of excessive nervous sensibility. The ciliary muscle, like any other muscle, is affected by lowered vitality, which comes with years. And, therefore, whereas a child can keep up a contraction of the ciliary muscle for a long time without discomfort, an older person is rendered uncomfortable by a much shorter period of activity. And as the muscular system is most vigorous at the beginning of the day, one can understand why the first complaints are usually made at the end of the day, for then the ciliary muscle has been used for several hours. Similarly, convalescence from a long illness may be the occasion of a person's first noticing dimness of vision or discomfort after the use of the eyes. This, again, explains why holidays may remove the headache, not only because holidays usually mean a rest from close work, but also because they restore the muscular vigour by means of an open-air life. And in like manner, refraction headaches may be removed by tonic medicines in some cases.

The amount of the error, of course, affects the amount of contraction that needs to be exerted:—1 or 2 D may be overcome comfortably, while the attempt to overcome 4 or 5 D quickly provokes pain. And no one habitually uses the whole of the contractile power of the muscle; 50 per cent.

was the amount, I think, which Donders reckoned the maximum that could be put forth with comfort.

#### EXPLANATION OF RELIEF OF HEADACHES BY CORRECTION OF ERRORS OF REFRACTION.

What happens, then, when one places, before an ametropic eye, a spectacle lens? If the lens be a convex one, the effect is as though one increased the length of the eye. A short eye—a hypermetropic eye—becomes, as it were, a longer eye. Or, in other words, the refractive media of the eye, by the addition of the lens, are made more powerful, so that rays come to a focus before they have passed so far back as they did before; and, if the spectacle lens is of just the right strength, parallel rays focus on the retina. As a consequence, the eye finds itself in the same condition as an emmetropic eye—rays coming from distant objects are focussed on the retina without any effort of accommodation at all—the ciliary muscle is not employed in looking at distant objects. And so what had caused the headache has been removed, for near vision now only requires the same accommodative effort as if the eye were emmetropic.

Again, if the lens—this time a concave one—be placed in front of a myopic, or long eye, the effect is as though one shortened the eye; in other words, made the refractive power of the eye weaker. Parallel rays, which before focussed in front of the retina, now have their focussing point displaced backwards. And if the concave lens be of just the right strength, then the focus is brought precisely on to the retina, and, again, distant objects are seen clearly. In looking at near objects, then, the myope, wearing his correcting lens, requires to exert the same amount of accommodation as an emmetrope, and, in those who begin the use of glasses early enough, the amount of accommodation called forth is the same as the convergence, and the two movements are associated, as they were intended to be.

If the eye be astigmatic, and one puts before it the cylindrical lens that corrects it, the influence of the added lens is exerted only in the meridian which is at fault, and the rays passing through that meridian are brought to a focus at the same place as the rays passing through the emmetropic meridian. Consequently vision is made clear, and the eye ceases



to exert any muscular action, except when it is turned to a near object, and then it behaves as an emmetropic eye. Not only, therefore, has the astigmatic eye been set free from the need of the action of the ciliary muscle, but it has also been relieved from the psychical irritation consequent upon inability to see clearly even with that action.

#### CHARACTERISTICS OF HEADACHES.

In order that my paper may have practical value it is desirable that I say something in closing as to how one may distinguish the headaches which are likely to be relieved by the correction of errors of refraction, from those that will not be influenced. Unfortunately, there is nothing characteristic about these headaches, either as to their position or their severity, or the time at which they occur. "The headache may vary from a moderate frontal distress to violent explosions of pain, and may be situated in any portion of the cranium."<sup>17</sup> Some points, however, may be noticed. There may, for example, be "great discomfort when attempting to watch moving objects."<sup>18</sup> In this connection, one has to remember what are called in America "theatre headaches," which come on after attending a play, or going through a picture-gallery, or watching a cinematograph exhibition; and also the headaches which so many people suffer from at the end of a long railway journey, during which they have spent the time which they did not give to reading in looking out of the window. "The pain may immediately follow the use of the eyes, or be delayed, or come on at a certain hour of the day, or even night."<sup>18</sup> And the headaches which depend upon ocular errors are frequently not associated with the use of the eyes at all by the sufferers. Toms,<sup>19</sup> who examined records of over twelve hundred patients, found "that one half . . . revealed ocular defects which were never surmised by the patients themselves, and many of them were exceedingly sceptical of the suspected cause, inasmuch as they could not directly attribute, subjectively, the cause to their eyes, their vision being apparently good for all distances and conditions of light or work."

Many of the headaches are what are called "bilious" headaches; and hemicranias and migraine occasionally are dependent on refractive errors.

Even though the headache does not develop until middle

life or even later, the eyes may still be the cause, in view of what I have shown as to the further influence of bodily vigour upon the ciliary muscle.

#### CONCLUSION.

In conclusion, therefore, I may sum up the attitude of ophthalmologists towards the relief of headaches as being that every case of headache which is not removed by other means should be suspected of refractive error, and that this suspicion should only be dismissed if refractive error is proved to be absent. Doubtless, in many cases, the spectacles fail to relieve the headache; but this only indicates that other conditions may co-exist with the error of refraction, and be of more importance in the causation of the trouble. A sufficient number of successful cases have been observed to encourage one in the expectation of relieving the headaches in this way. Of course, unsuccessful cases exist; of those I do not speak, for unsuccessful cases do not, as a rule, return to us—they try someone else; but if that someone else again examines the refraction, as he often does, and prescribes spectacles, and so relieves the headache, then the case becomes a successful one.

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## A REVIEW OF RECENT WORK ON THE DISEASES OF CHILDREN.

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*Acute Anterior Poliomyelitis.*—One of the most interesting and important diseases from which children suffer is acute anterior poliomyelitis. In its plainer and more obvious forms it is easy enough to recognise, but there are few diseases which present more difficulties in diagnosis, and more especially in prognosis, where the physician is confronted with some of its more obscure manifestations. The cause of the disease is unknown, but there is slowly accumulating a mass of evidence which inclines the profession to assign to the disease an infective origin. Additions to this evidence are contained in three papers published in May of this year in the *Archives of Pediatrics*. The first of these is a study by Koplik, of New York,<sup>1</sup> of the epidemic of the disease which occurred in that city in the summer of 1908. He records that in that season over 1,200 cases of the disease were reported to the City and State Boards of Health. It attacked children of all classes, and was not limited to any particular portion of the City or State. There was nothing either in the climatic conditions, or in the water supply, which was unusual at that period of the year; and Koplik concludes that, so far as regards local conditions, the causes of the epidemic must remain a matter of speculation. The general characteristics of the disease in this epidemic did not in any way resemble what is usually understood by acute anterior poliomyelitis; but on the other hand they resembled closely, according to Koplik, the symptoms seen in a similar epidemic in Sweden, described by Harbitz. At the onset the disease frequently simulated meningitis, but it was quickly seen that it did not run a course like that of any recognised form of meningitis. Koplik describes various forms of the disease as he met with them clinically: a cerebral form in



which the patient became stuporous, with fever, headache, and vomiting, the symptoms being quickly followed by paralysis of varying extent, and in some instances terminating by paralysis of the respiratory muscles due to affection of the bulbar and medullary centres. In other instances the chief feature was acute pain in the limbs followed by the slow development of paralysis—cases, says Koplik, frequently mistaken at first for acute rheumatism. In this group complete recovery was not unusual after some weeks or months, and Koplik regards this fact as evidence of their neuritic character. With these two groups was associated a third, consisting of such cases as are usually seen at times when no epidemic is present. As Koplik very truly says, the nomenclature of the disease must be reconsidered; many of these cases can hardly be described as poliomyelitis, and the lesions found in the brain in the cerebral cases do not in the least coincide with the usual descriptions of the pathological appearances in cases of acute poliomyelitis, while they are identical with those described by Harbitz. As to causation Koplik offers two suggestions. He found that a large proportion of patients had either some intestinal disturbance, or the history of recent tonsillitis. Actual evidence of infection of the cerebro-spinal tract was, however, entirely wanting.

Another paper by Dr. Hymanson,<sup>2</sup> of New York, is less general in tone, giving a detailed description of five cases observed by him in the course of the epidemic, three of which were instances of facial paralysis.

A third paper in the same issue is by Dr. La Fetra,<sup>3</sup> describing the early symptoms, and the results of the examinations of the blood and cerebro-spinal fluids.

These papers are all of unusual interest because from time to time cases occur in London, and no doubt in other large towns in this country, which correspond closely to the descriptions given, and differ so widely, as Koplik says, from the accepted type of poliomyelitis as to raise the greatest difficulty in diagnosis. Unfortunately the occurrence of this epidemic in New York has not added anything to our knowledge of the causation of the disease in spite of elaborate researches on the available material, and in the absence of that knowledge the treatment of the disease remains sympto-

matic. The hope of effective therapeutic measures lies in the discovery of the infective agent.

*The Prognosis of Heart Disease.*—In the *British Journal of Children's Diseases*, Dr. Douglas Stanley\* discusses the prognosis of cardiac disease. It is a subject fruitful of discussion and, as he implies, apt to give rise to extremely diverse opinions. Physicians who derive a large part of their experience from the treatment of hospital patients are undoubtedly liable to take too gloomy a view of the prospects of the child suffering from cardiac disease, and they can seldom keep sufficiently in touch with their patients to trace their after-history. Those physicians on the other hand who are engaged in private practice, and are able to follow their cases for many years, have not usually sufficient numbers of cases of cardiac disease to be able to draw broad conclusions from a study of the results. Not only is this the case with regard to acquired heart disease, but we believe it to be also true of certain forms of congenital cardiac murmurs. Dr. Stanley takes on the whole an optimistic view; he believes that it is not only possible, but not very infrequent, for a severe cardiac lesion to be repaired so completely that in a few years no evidence of the original mischief will be found even on careful examination. He quotes some interesting cases in support of his views. The writer of these notes shares Dr. Stanley's optimism, but confesses that he has no knowledge which will enable him to predict with any confidence the course which an individual cardiac lesion will pursue. It appears to him that the experience of any one man is wholly insufficient for the proper consideration of this question, and he would suggest that it should be taken up by medical societies in various parts of the country, and thoroughly investigated. The great difficulty in such investigation, however, is that in so many instances the notes of cases are mislaid in the course of years, and that the doctor's memory is apt to be somewhat confused as to details. Moreover, in cases where there is complete recovery there is always forthcoming, as Dr. Stanley says, the suggestion that the original lesion was not a true instance of endocarditis, but, as it is called, of functional disease. Still the collection and publication of carefully-compiled statistics from the general practitioners of the country could hardly

fail to be of great usefulness, and would probably lead to considerable modification of our present ideas on the subject.

*Treatment of Meningitis.*—A new drug which seems to promise well is briefly mentioned in the *New York Medical Journal* for April. The original paper is contained in the *Johns Hopkins Hospital Bulletin*, April, 1909. The drug is hexamethylenamine, and it has been experimentally shown that a short time after its administration by the mouth its presence can be demonstrated in the cerebro-spinal fluid, and that it was sufficient to inhibit the growth of micro-organisms in the fluid. Further, its administration delayed the onset of meningitis in dogs and rabbits when streptococci were injected into the pia-arachnoid. In the paper quoted there is one clinical case recorded in which a cerebro-spinal fistula resulting from operation is said to have closed shortly after the administration of the drug was begun.

*Feeble-minded Children.*—The recent publication of the *Report of the Commission on the Care and Control of the Feeble-minded* has induced Dr. W. A. Potts<sup>5</sup> to review at some length the present state of our knowledge regarding the origin of mental deficiencies. He regards the feeble-minded as divisible into two classes, due to deviations from the normal standard, and to degenerative changes in the brain and spinal cord. The first of these classes he would regard as comparatively small, and he believes that it will become still smaller as our knowledge of the factors which make for deterioration becomes wider. He disagrees profoundly, and we imagine most scientific men will join him, with the statement of the Commission that "there is the highest degree of probability that feeble-mindedness is usually spontaneous in origin." The other statement in the *Report*, that "feeble-mindedness tends strongly to be inherited," no one, says Dr. Pott, is inclined to question. At the same time he utters some very necessary cautions with regard to this question of heredity. It is not enough to ascertain that a certain disease, *e.g.*, tuberculosis, has occurred in the family of the patient; it is necessary to discover whether the incidence of tuberculosis in the family is greater or less than the normal incidence in the population at large. Dr. Karl Pearson and the Biometric School have, says Dr. Pott, rendered great service by insisting



on precision of thought and statement in regard to questions such as these. The second class of Dr. Pott's classification will hence include the great majority of all cases of feeble-mindedness, and it becomes of the greatest importance to be able to recognise, and if possible to prevent, all those influences which tend to deteriorate the germ-plasm. Tubercle, syphilis, and alcohol can all be shown by careful statistical examination of large numbers both of normal and of feeble-minded children to have a very definite share in the inheritance of the feeble-minded ; and it is interesting to note that these three factors, and often others, coincided to produce the feeble-minded child ; or, as Dr. Potts says, the causation of feeble-mindedness is far more often complex than due to a single factor of inheritance. The question of the influence of attempts to procure abortion is discussed, but though there are facts which tend to point to the influence of such procedure in the production of feeble-mindedness, there is not sufficient evidence in mass to warrant any definite statement. Dr. Potts concludes his most interesting remarks with the significant sentence that "evidence is pouring in from all sides that everything which interferes with true hygiene does contribute to increase the present appalling number of incapable members of the community." The difficulties in the way of progress in this branch of medical knowledge are obvious, but we may hope that with the establishment of efficient medical inspection of school children much wider knowledge of the causes of mental defects will before long be available.

*Treatment of Chorea.*—The treatment of chorea is admitted by all physicians of experience in children's diseases to be by no means satisfactory.<sup>8</sup> Dr. James Burnet in an article published last year has advocated anew the claims of salicylate of soda and aceto-salicylic acid (aspirin). He regards chorea as essentially a manifestation of rheumatism, a belief which has steadily gained ground for many years in this country, though by no means universally accepted. It is, however, certain that a very large number of cases of chorea either succeed or precede attacks of rheumatic fever, and though from time to time cases occur in which no evidence or history of rheumatism either in the patient or his or her family can be obtained, such cases are comparatively rare, and should always raise the suspicion that

the diagnosis is mistaken. Dr. Burnet, however, believes that chorea is essentially a rheumatic manifestation, and, acting on this belief, has treated a considerable number of cases with aspirin. He thinks that on the whole this drug has produced better results than any other in common use, and though of course he does not claim that it controls the choreic movements, he thinks that the course of the disease is somewhat shortened. He makes the wise remark that in most, if not all, cases of chorea the heart is dilated, a fact which is apt to be overlooked, but which is easily demonstrable by careful percussion, and would treat all cases by rest in bed in addition to the administration of the drug. This is undoubtedly a wise measure, especially in the earlier weeks of an attack of chorea, but in some of the more protracted cases it is of doubtful value. Massage Dr. Burnet values highly, but he does not mention a system of graduated exercises to re-educate the sense of co-ordination. This paper sums up very completely the more modern views of the origin and treatment of chorea; insisting that the administration of arsenic, zinc, sulphate, and sundry other drugs, either in small, or often in heroic, doses is unscientific, and has no firm foundation even in the empirical results. The question of the origin of chorea, which Dr. Burnet for his present purpose treats as certainly rheumatic, is of great interest, and can only be settled effectively by the advance of bacteriological knowledge. But that there is a form of disease which is unhesitatingly diagnosed as chorea by skilled physicians, and yet has no connection with rheumatic infection, is, I think, certain. Whether it is possible to make a clinical distinction between the rheumatic and non-rheumatic cases is doubtful, and with the evidence that we have of the frequency of subsequent rheumatism, it is always open to the supporters of that theory to claim that the ensuing years will prove the accuracy of their contention. Meanwhile we are convinced that Dr. Burnet's plea for the more prolonged treatment of chorea on anti-rheumatic principles is an indication of the only course that a wise physician should follow.

*The Sequelæ of Scarlet Fever.*—The ætiology of scarlet fever still remains unsettled, but the medical journals contain many studies devoted to its clinical aspects. <sup>7</sup> Schick has written an

interesting paper upon the sequelæ of the disease, in the course of which he discusses the question of post-scarlatinal rheumatism, which occurs most often during the second week of the disease, and is often associated with endocarditis. Whether the pains of the joints in all cases are of rheumatic origin is an open question, and <sup>8</sup> Wladimiroff considers that where they are of considerable duration they should rather be ascribed to a neuritis. Nephritis is according to all authors a rare complication and occurs later in the disease, not usually before the middle of the third week, though albuminuria is extremely frequent in the first and second weeks. The main characteristic of the scarlatinal nephritis appears to be its insidious onset, which may be first signalled by uræmic convulsions. In passing it may be noted that scarlatinal nephritis is generally not a lasting inflammation, the majority of the cases recovering to all appearances rapidly and completely; but at the same time we know of no statistics which will enable us to judge of the subsequent history of these cases: the only hint that we can obtain is that scarlet fever is not at all commonly recorded in the history of the cases of nephritis, subacute and chronic, in children or young adults.

Herrman<sup>9</sup> has an interesting article on scarlet-fever carriers, in the course of which he labours to show that the idea still widely prevalent that the principal source of the infection is the desquamated epithelium is quite erroneous. He believes, in common with most recent students of the disease, that the discharges from the nose, ears, and throat are of far greater importance, and urges that, before allowing a patient to return to family life, special attention should be paid to the possible presence of adenoids and to decayed teeth. He also believes that any open wound is extremely liable to become the port of entry to the infecting agent, and that patients after operation should be scrupulously protected from all possible contact with scarlet-fever convalescents. A case illustrating this last point is published in detail by Van der Bogert.<sup>10</sup> A boy aged five years injured his foot with a rusty nail, and though the wound healed quickly eighteen days later, typical scarlet fever developed, the first symptom being an acute inflammation of the injured foot, followed two days later by a typical rash and sore throat. The diagnosis was con-



firmed by the patient communicating the disease to a sister, and by the characteristic prolonged desquamation. Van der Bogert believes that the wound was infected about ten days after it was inflicted.

A very rare complication of scarlatina—meningitis—is discussed by Frost<sup>11</sup> and by Benard.<sup>12</sup> Frost's case had all the classical symptoms of a meningitis, together with optic neuritis and nystagmus. At the end of two months complete recovery had taken place. The condition of the cerebro-spinal fluid is not noted. Benard's is a more complete study of the condition; he has collected 25 cases, in the great majority of which the infection was secondary to suppuration in the ear or in one of the cranial sinuses. The organism isolated has usually been a streptococcus. The prognosis in his opinion is not wholly unfavourable and must depend on the conditions found in the cerebro-spinal fluid. Where pus is present the outlook is hopeless; where the majority of the cells are lymphocytes recovery not infrequently takes place, and if organisms only are found without any cellular deposit the prognosis is favourable. The majority of the cases recorded have developed during the stage of desquamation.

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# ON DELAY OR RETARDATION OF THE PULSE AS A SIGN OF ANEURYSM.<sup>1</sup>

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REGARDING the question of asynchronism of the radial pulses in cases of aneurysm, the importance of which as a diagnostic sign is not sufficiently recognised, there seems to be much difference of opinion. Perhaps the majority of authors, to mention merely Broadbent,<sup>1</sup> Roberts,<sup>2</sup> Osler,<sup>3</sup> Colbeck,<sup>4</sup> François Frank,<sup>5</sup> Marey,<sup>6</sup> and Von Frey,<sup>7</sup> teach that in aortic aneurysm there may be some delay of one of the radial pulses, although Frank is the only one who has reported a specific example, and published tracings demonstrating the fact. There are, however, on the other hand, equally experienced clinicians who express the opposite opinion, and among those who have written on the subject may be mentioned Mackenzie<sup>8</sup> and Litten.<sup>9</sup> These latter consider that it is a false impression due to the entirely different characters of the two pulses, and hold that it is well-nigh impossible to speak definitely regarding any individual case, at least from digital examination alone. The altered pulse is as a rule, though not invariably, smaller, and reaches its maximum more gradually and disappears more slowly.

Mackenzie,<sup>8</sup> in his monograph on "The Study of the Pulse," records an instance of aortic aneurysm in which, from digital examination, one was inclined to diagnose delay of the left radial pulse, but a more critical examination with the polygraph showed that the two radial pulses were absolutely synchronous. Quite recently I had a similar experience in a patient suffering from aneurysm of the aortic arch. From digital examination I was certain that the left radial pulse was considerably delayed after the right, but frequent examinations with the polygraph convinced me that the delay was only

<sup>1</sup> From the clinique of the Professor of Practice of Medicine and from the Physiological Laboratory, Glasgow University.

apparent, and must be the result of a false impression.

François Frank,<sup>6</sup> however, 30 years ago, reported two cases of aneurysm of the innominate artery with delay of the right radial and right carotid pulses, and drew attention at that time to the diagnostic value of this sign. In one of the cases he recorded by means of the limb plethysmograph the pulsations in both hands synchronously with those of the aneurysm, and in the other case either radial pulse with the apex beat. In his opinion delay, or, as he terms it, exaggerated delay or retardation of the right radial and right carotid pulses was pathognomonic of an innominate aneurysm, and of the left radial pulse of an aortic aneurysm arising beyond the commencement of the innominate artery, but before the origin of the subclavian; whereas an aneurysm of the ascending aorta would cause an exaggerated retardation of both radial pulses. In fact, according to this author, the diagnostic value of delay of the pulse is of prime importance, and in marked contrast to the other abnormalities, as, *e.g.*, diminution in volume. In this connection it should be remembered that, according to the researches of Ozanam<sup>10</sup> and Beaunis,<sup>11</sup> the two radial pulses do not normally beat synchronously. The former states that the left radial pulse reaches the wrist 1.5 to 3.5 hundredths of a second after the right radial pulse, while the latter estimated the delay of the left radial pulse to be at least  $\frac{2}{100}$  sec. This fact of the normal asynchronicity of the two radial pulses must of course enhance the diagnostic value of the presence of any degree of delay of the right radial pulse.

The pulse-wave after passing through an aneurysmal sac is usually diminished, but it may be increased in fulness, which is believed by Frank to be due to a paralysis of the *nervi vasorum*. This author has observed two cases of innominate aneurysm in which the right radial pulse was fuller and gave more ample tracings than the left. Diminution in the size of the pulse, however, may also be due to pressure of an aneurysm on the artery, and not to the wave being altered as it passes through its lumen. For instance, an aortic aneurysm according to its situation may, by pressure on either the innominate or subclavian arteries, cause a diminution in the size of either the right or left radial pulse.



It is thus seen that the character of the pulse wave may be influenced either by pressure from without or by its passage through an aneurysm. The volume of the pulse can be affected by both of these factors, but delay can only be produced by the latter. That mere pressure will not cause delay can be easily demonstrated by compressing any arterial trunk, and recording synchronously, say, with the apex beat, the pulse obtained beyond the point of compression before and after compression. In this manner I found it impossible to induce any delay of the pulse, though variable degrees of pressure, even up to a point almost sufficient to obliterate the pulse, were employed. Consequently, so far as localisation of the aneurysm is concerned, diminution in the size of the pulse has no diagnostic value. Not so, however, asynchronism of the pulses. As Frank suggests, it may be possible by a study of the carotid and radial pulses, with reference to synchronism, to differentiate between aneurysms of aorta, innominate artery, and either subclavian artery. Indeed, it may only be possible by this means to distinguish between an inoperable aneurysm of innominate artery and the more curable one of the thoracic portion of the right subclavian artery: in the former there would be delay of both the carotid and radial pulses, while in the latter the radial pulse would alone be involved. This raises the question of delay, therefore, beyond the sphere of mere academic interest, and gives this physical sign a most important practical bearing.

In view of the diversity of opinion regarding even the mere existence of the phenomenon, but more especially in the light of its possible value as a physical sign, and also as I had the opportunity of observing two cases which presented some delay of the right radial pulse, it occurred to me that by approaching the subject from the purely physical aspect, and carrying out experiments with artificial aneurysms and rubber tubing, much might be learned regarding the phenomenon. Some might hold that the conditions prevailing *in corpore* cannot be simulated experimentally, but with this opinion I do not agree. The transmission and character of the pulse are due for the most part to physical causes, to the passage of a wave of increased pressure along the artery. If one leaves out of consideration the muscular tissue of the arterial wall—and in the arteries which are usually subject to

aneurysm this is present in a negligible amount—the artery is simply an elastic tube. An aneurysm is a dilated and often more expansile part of an arterial trunk, and its wall, consequent on the degeneration of the *tunica media*, contains even less or, in many cases, no muscular tissue; in many instances the wall may be entirely composed of fibrous tissue, of the extensibility of which one has almost daily experience. Thus it seems to me quite feasible to imitate the conditions experimentally, and to study the pulse under varying circumstances. This I have done and was able to demonstrate the delay and the alteration in force and character of the pulse wave after passing through an aneurysm.

François Frank,<sup>5</sup> Marey,<sup>6</sup> and Von Frey<sup>7</sup> have all worked at the influence of an aneurysm on the pulse wave from the experimental aspect, but so far as I can find François Frank's tracings are the only ones extant. Von Frey in his writings deals chiefly with the loss in volume of the pulse, and draws attention to the different results obtained with single and repeated pulsations, asserting that with repeated pulsations the variations from normal become less marked. Marey states that it is not from the existence of an aneurysm as a simple dilatation, but from its increased extensibility, that the pulse wave is modified and retarded. In his experiments he found that, if a non-expansile dilatation (*e.g.*, a glass bulb) were introduced instead of a dilatable rubber one, there would be no alteration in the character or in the time of passage of the pulse wave.

Mackenzie,<sup>8</sup> while discussing this question of delay of the pulse, acknowledges François Frank's work, but does not consider his tracings conclusive. Undoubtedly this author's tracings from the actual cases leave much to be desired, but so far as his experimental results are concerned they unquestionably demonstrate delay. Unfortunately, however, waves passing through two tubes of equal length and diameter, but one with and the other without an aneurysm, were not synchronously recorded. Nor did he imitate so closely as I have the conditions prevailing in the normal circulation.

The following is a description, and Fig. 1 is a sketch of the apparatus which I employed. An artificial circulation was constructed from rubber tubing, a thick and wide portion (*a*) representing the aorta, and a similar portion (*v*) acting as

the main venous trunks. On one side these two pieces of tubing were connected to the afferent and efferent tubes of an enema syringe (s), which had a valve (*d* and *d'*) on either

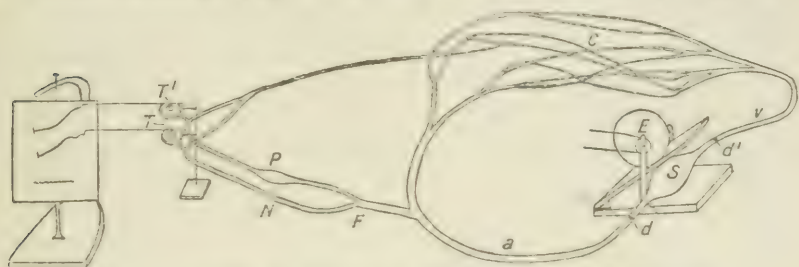


Fig. 1.—Scheme of apparatus employed in the experiments.

side of the bulb. Intervening between the other two ends of the arterial and venous trunks was a branched collection of finer tubing (*c*), which represented the capillary circulation with its peripheral resistance. Several equal lengths of rubber tubing, specially prepared in order to ensure uniform thickness of wall and diameter of lumen, were obtained, and at about the centre of some of them aneurysms, varying in length between  $1\frac{1}{2}$  inches and  $5\frac{1}{2}$  inches, were ballooned. Two of these pieces of tubing, one with an aneurysm (*P*) and the other without (*N*), were connected to a side branch of the main arterial trunk by means of a Y-shaped piece of glass tubing (*F*), and by similar means they were brought into continuity with the capillary circulation. At points equidistant from the fork of the Y-shaped glass tube on the arterial side, and beyond the aneurysm, a recording tambour (*T* and *T'*) was attached by means of a very short side branch to each of these two pieces of tubing. The whole apparatus was filled with water and experiments were carried out with the fluid under varying pressures. In this way pulse waves passing through a tube with an aneurysm and one without an aneurysm could be synchronously recorded. The enema bulb or artificial heart was pumped by placing it between two pieces of wood hinged together and approximated by an eccentric (*E*), which was driven by an electric engine at various regular rates. The records were taken on an upright cylinder, but by transposing the tambours, at one time having the aneurysm tambour above and at another time below, it was found that this fact had no influence on the result, at least so far



as delay was concerned. When the aneurysm record was taken below, the wave was slightly fuller than when it was above, but otherwise no difference could be detected. This increased volume of the lower pulse was probably due to hydrostatic pressure. Similarly by reversing the tambours on the tubes the absence of any fallacy here, *i.e.*, in connection with a difference between the two tambours, was clearly proved. It should also be stated that tracings were taken with the aneurysm tube fully 2 inches shorter than the control tube, in order to see whether a slight difference in the length of the tubes could influence the result, but it was found that the delay of the aneurysmal wave was not lessened to any appreciable extent (Fig. 2). As previously

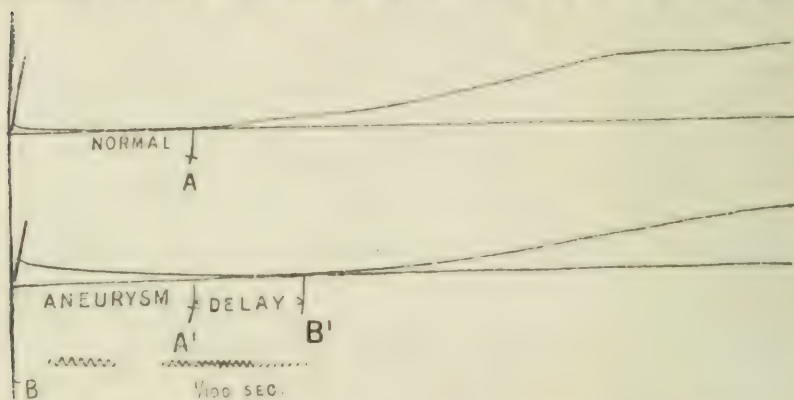


Fig. 2.— When this tracing was taken the aneurysm tube was fully  $1\frac{1}{2}$  inches shorter than the normal tube, yet there is marked delay ( $A' B'$ ) measuring  $\frac{1}{100}$  sec.

mentioned, experiments were conducted with varying rates of pulsations, and the apparatus was always set agoing for some time before a record was taken.

With this apparatus, and granted a certain condition, it was invariably found that the pulse wave in passing through the aneurysm underwent a marked modification. In comparison with a wave passing through a tube of similar make and of equal length and diameter, but without any aneurysmal dilatation, the former was less ample and showed a disappearance of the recoil or dichrotic wave; also it was quite appreciably delayed. The wave made its appearance later, reached its maximum more gradually and at a later date,

and it was slower and later in disappearing (Fig. 3). The necessary condition referred to above was a sufficient pressure within the apparatus to cause the aneurysm to dilate. Its cavity must increase in volume, and it is in this that the whole cause of the phenomenon lies. A non-expansile dilatation of

P 55 R. 88 per minute

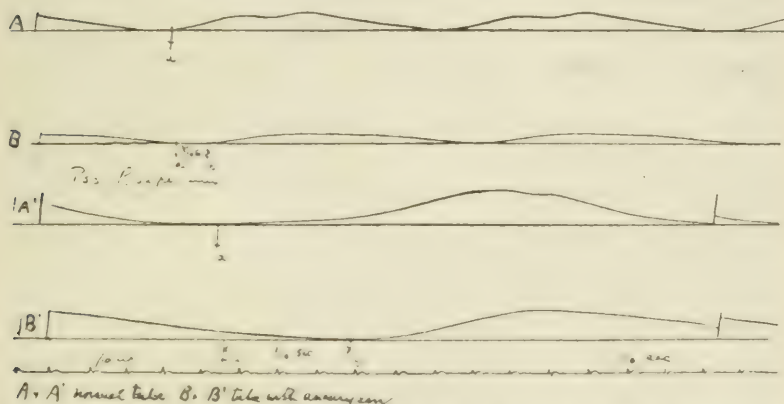


Fig. 3.—Two series of tracings taken with same aneurysm and under same pressure but with different rates of pulsation. Note the general character of the two waves and that the delay is much more marked in the lower tracing, where the rate was only 52 per minute instead of 88 per minute, as in case of upper tracing. P represents pressure of water within apparatus in millimetres and R the pulse rate.

a tube will not cause any alteration of the wave, and most assuredly it will not cause any delay. This has been shown by other observers. In this connection I might mention that, according to François Frank, it is with a low pressure that delay occurs. Theoretically, one could understand this, and

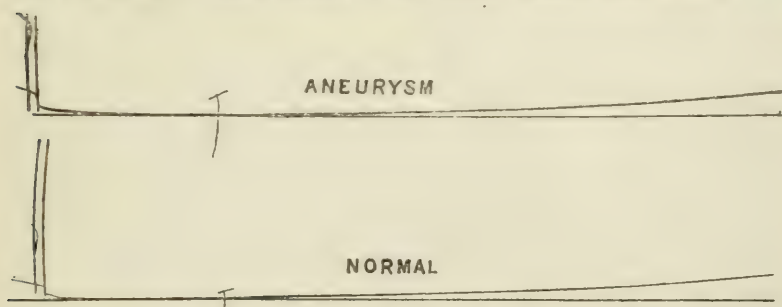


Fig. 4.—Tracings taken with a low pressure and aneurysm not distending with pulsations. Note the absence of delay.

especially clinically, but my experiments do not lend any support to this view. With a very low pressure the aneurysm may not be brought into play, will not distend with the pulsations, and fail to induce delay (Fig. 4), but simply by raising the pressure, as I demonstrated on several occasions, the aneurysm will commence to dilate and the delay of the pulse wave will make its appearance. Moreover, by supporting the aneurysm in the hand and hindering its distension all delay at once disappears. It is also conceivable that with a very high pressure the wall of the aneurysm might become so taut as to lose its elasticity, and thus come into the category of a non-elastic dilatation, which, as we have already seen, causes no alteration or delay of the pulse wave. Personally, I was unsuccessful in raising the pressure sufficiently high to eliminate the delay without rupturing the aneurysm.

During the course of my experiments I found that the degree of retardation varied, and that it was influenced by three separate factors, viz. :—the pressure within the apparatus, the size of the aneurysmal sac, and the rate of pulsation. It has already been shown that a certain pressure is necessary before any delay at all will appear. While working with different aneurysms it was found that the degree of retardation was roughly proportionate to their size, an aneurysm  $5\frac{1}{2}$  inches in length causing about twice as much delay as one only  $1\frac{1}{2}$  inches in length. The amount of delay was also observed to vary with the rate of pulsation, a point, as above mentioned, previously noted by Von Frey. In Fig. 3 it will be seen that with a constant pressure and the same aneurysm a rate of 88 pulsations per minute produced a delay of one-tenth second, while with a rate of 52 pulsations per minute there was a delay of three-tenths second.

The following is a brief account of one of the cases which I have personally observed. The patient was a man *æt.* 39 years, and was employed on the railway in the arduous work of collecting and distributing tarpaulin covers, each of which weighs 1 to  $1\frac{1}{2}$  cwts., and which are used to cover loaded wagons. He was admitted to Professor Samson Gemmell's wards in the Glasgow Western Infirmary on 9th December, 1907, complaining of pain in the throat and chest and hoarseness—all of one month's duration. He ascribed the origin of his illness to a wetting, which he received on



4th November, 1907, as shortly afterwards he developed a sore throat with pain in the chest, and a cough which was accompanied by a yellowish expectoration. All these symptoms increased in severity, and about ten days after the onset of the illness the hoarseness suddenly became worse, and dyspnœa appeared on exertion, such as ascending a stair.

*Previous Health.*—He had been in the army and had spent  $8\frac{1}{2}$  years in India. Twenty years ago he had contracted "syphilis," and 15 years previously he had suffered from "enteric fever."

*On admission* his chief complaint was of pain which suggested to his mind a heavy weight lying on his chest. This pain, which was distributed over a band-shaped area on a level with the nipples, was increased on coughing, or after lying for any time in one position. He had a paroxysmal brassy cough and he emitted frothy sputum, which was at times tinged with blood. The voice was hoarse, but not quite toneless. There was neither dyspnœa nor dysphagia. Examination of the chest revealed a slight prominence over the right side of the sternum but there was no sensible impulse. Aortic pulsation was palpable in the episternal notch, and pulsation was visible on both sides of the neck, but especially on the right side. There was relative dulness to percussion over the manubrium sterni and to the right of the sternum. This patch of dulness extended down the sternum and merged with the area of cardiac dulness, which was slightly enlarged; the apex impulse was situated in the fifth left interspace  $4\frac{1}{4}$  inches from the mid-sternum. No murmur was audible, nor was the second sound at the aortic region accentuated. On examination with the X-rays a pulsating tumour was seen in the region of the manubrium sterni, extending a little beyond the edge on either side but rather more towards the right. The pulse rate was 60 per minute. With the finger a marked difference was detected between the two radial pulses. The right was very small and feeble and gave one the impression of being considerably delayed in comparison with the left. A similar difference was noted between the right and left common carotid pulses. By means of the clinical polygraph tracings of each radial pulse were recorded synchronously with the apex impulse. (Figs. 5 and 6.) In Fig. 5, showing the left radial pulse and apex beat, it will be observed that the summit of the wave due to the

cardiac impulse coincides exactly with the appearance or rise of the pulse wave. In Fig. 6, however, which represents synchronous records of the right radial pulse and apex beat, it will be noted that at a similar epoch in the cardiac cycle a pulse wave is still declining, and that the corresponding pulse wave is delayed about one-quarter of the time intervening between

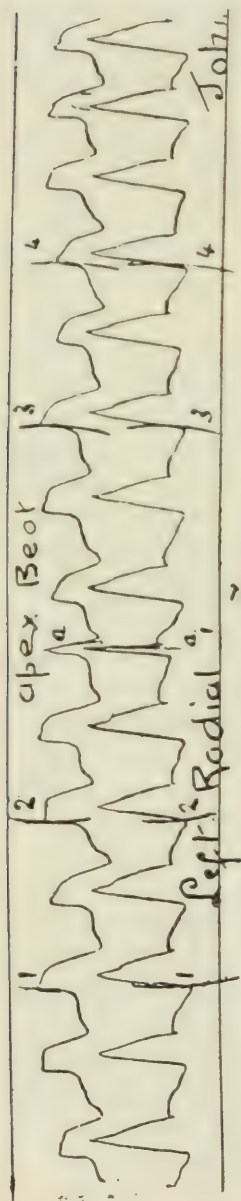


Fig. 5.—Polygram of apex beat and left radial pulse. *a* and *a'* are ordinates, and 1, 2, 3 and 4 are lines marking similar points of time in the two tracings reckoned from the ordinates *a* and *a'*.

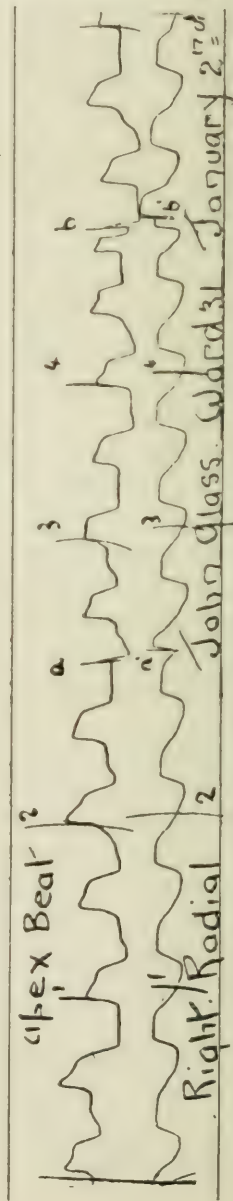


Fig. 6.—Polygram of apex beat and right radial pulse. The letters and numbers have the same significance as in Fig. 5. Comparison of Figs. 5 and 6 shows delay of radial pulse in latter.

two cardiac beats, which, with a pulse rate of 60 per minute, represents  $\frac{1}{4}$  second. Each common carotid pulse was similarly compared with the left radial pulse, and undoubted delay of the right carotid pulse was also demonstrated (Figs. 7 and 8).

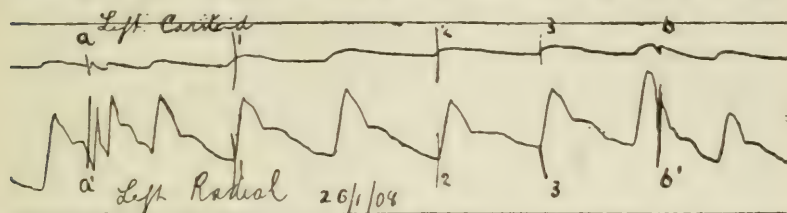


Fig. 7.—Polygram of left carotid and left radial pulses. The letters and numbers have the same significance as in Fig. 6. Note that the carotid pulse is in front of the radial pulse.

The trachea at the root of the neck was deeply placed and are deflected towards the left. Tracheal tugging was marked.

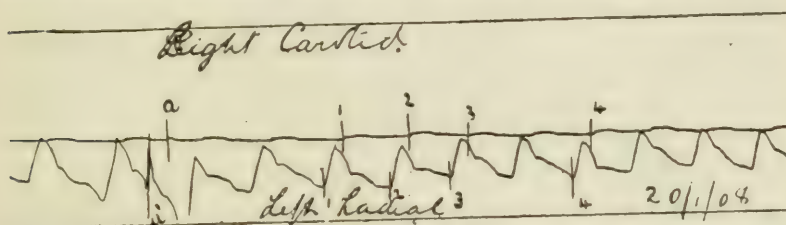


Fig. 8.—Polygram of right carotid and left radial pulses. Note that here the carotid pulse is behind the radial pulse.

Laryngoscopic examination revealed paralysis of the left vocal cord, which assumed the cadaveric position. Nothing abnormal was detected in either lungs or abdomen. There was no albuminuria.

During his residence in hospital the patient had one or two severe attacks of hæmoptysis, but he was discharged after twelve weeks' treatment distinctly improved so far as his symptoms were concerned. Unfortunately, however, he died suddenly at his own home from profuse hæmorrhage, and, as we only learned of the accident some time afterwards, there was no opportunity afforded us of obtaining a post-mortem examination. Our diagnosis in this case must, therefore, remain more or less uncertain, though there is little doubt that it was one of thoracic aneurysm, but in connection with what vessel the aneurysm originated is a question more difficult to answer. The tracheal tugging and the paralysis



of the left vocal cord would rather point to an aneurysm of the transverse portion of the arch of aorta, but the delay of the right radial and common carotid pulses tends towards another diagnosis, viz.:—aneurysm of the innominate artery. This diagnosis, though unfortunately not substantiated by post-mortem evidence, obtains strong support from a consideration of the previous clinical and experimental data.

The explanation of this phenomenon of increased retardation of the pulse seems to me to be the following. In response to the cardiac pulsations pressure waves are transmitted along the column of blood and determine waves of dilatation along the vessel. It is these dilatations of the vessel which are recorded by the sphygmograph. Clearly the resistance of the vessel wall will materially influence the character and rate of transmission of these pressure waves, for increase of extensibility will allow of a greater amplitude with a temporary diminution in pressure, and consequently, a temporary arrest or retardation of the propagation of the pressure wave. And according to the degree of distensibility of the aneurysmal sac there will be, as our experiments show, a more or less marked retardation of the pulse. It is quite understandable, too, how the variation in rate of pulsation should also influence the degree of retardation. The less frequent the pulsations the longer the diastole and the greater the contraction of the aneurysm, and consequently, the greater the degree of possible dilatation.

It is of course not necessary that clinically all aneurysms should cause this change in the pulse. If the aneurysm be in great part filled with blood clot, and such not infrequently occurs, leaving merely a narrow channel, narrower it may be than the artery on either side, there will be no great increased capacity of the sac, and consequently no retardation of the pulse. Moreover, in the light of the experiments described above it is not unlikely that the blood pressure will also play a part in causing the delay, in so far as it may or may not be sufficient to dilate the aneurysm. It is also possible that this sign considered in conjunction with the degree of systolic pressure may lend some prognostic help. Retardation of the pulse in the presence of a low blood pressure would incline one to the view that the wall of the aneurysmal sac was considerably thinned, and would be not unlikely to rupture as the result of any slight exertion

on the part of the patient. On the other hand, the absence of this sign in a case with a high systolic pressure is in favour of the sac having a considerably thick and strong inelastic wall.

However we may explain the condition the fact remains, based on the grounds of both clinical and experimental observations, that an aneurysm or a dilated and more expansile part of a tube causes delay or increased retardation in the passage of a pressure wave along its course.

In conclusion, I must express my indebtedness to Prof. Noel Paton, in whose laboratory the experimental portion of the work was carried out, and to Prof. Samson Gemmell for permission to utilise the clinical material.

#### SUMMARY.

1. In cases of thoracic aneurysm delay or increased retardation of one of the radial pulses does occur.

2. The same delay may or may not be present in the case of the corresponding carotid pulse.

3. If the idea, based on experimental physics, be correct, that delay of the pulse wave is only produced as the result of the wave passing through the aneurysm, then the phenomenon of delay should be a most important diagnostic aid in the localisation of the aneurysm.

4. Digital examination is not a reliable test of the presence or absence of delay. The finger may miss the delay when present, and may diagnose it when absent. A more delicate instrument, such as the clinical polygraph, is necessary.

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## DISORDERS OF GASTRIC SECRETION.

## A REVIEW OF SOME RECENT WORK.

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THE modern conception of disorders of gastric secretion, dating from the fundamental observation by Reichmann in 1882 of the occurrence of excessive secretory activity, has been evolved amidst much controversy.

Based on the analyses of the stomach contents after test-meals the controversy has waged chiefly about the interpretation of the results of such analyses in terms of variations in the specific secretory activity of the stomach alone, or in association with transudation—the so-called dilution secretion—and of variations in the motility of the organ.

In the absence of any method of determining the amount of gastric juice secreted and of obtaining the juice apart from the food ingested, the significance of such analyses as an index of the secretory activity of the stomach has been sought after by the elaboration of methods for estimating the motility of the stomach, which, however, are yet far from being perfect.

Again, the experimental study of gastric secretion in gastrostomised human beings by Bickel,<sup>1</sup> Bogen,<sup>2</sup> Kaznelson,<sup>3</sup> Hornborg,<sup>4</sup> and Sommerfeld, confirming the results obtained by Pawlow and his co-workers in animals, has further shown that a reconsideration of the disorders of secretion from the standpoint of the normal secretory activity is necessary.

Hitherto it has been generally accepted that the disorders of gastric secretion conform with the following types:—

## A.—EXCESSIVE SECRETORY ACTIVITY.

1. Hyperchlorhydria or hyperacidity: a *qualitative* disorder characterised by the secretion in response to the ingestion of food of gastric juice normal in quantity, but containing an abnormally high percentage of hydrochloric acid.

2. Hypersecretion or supersecretion: a *quantitative* disorder characterised by the secretion of gastric juice in abnormally large quantities, and which might occur:—

(a) Continuously—not only in response to the ingestion



of food, but also in the fasting stomach—a chronic type described by Reichmann—Reichmann's disease.

(b) Intermittently—a similar disorder occurring in paroxysms with intervals of normal or less disordered secretory activity—described by Sahli as constituting certain of the gastric crises of locomotor ataxia.

(c) Alimentary or digestive type in which the hypersecretion occurs in response to the ingestion of food only.

#### B.—DEFICIENT SECRETORY ACTIVITY.

Quantitative disorders characterised by the secretion of deficient quantities of gastric juice—an acidity or hypochlorhydria, or by a complete absence of secretion—achylia.

The conception of hyperchlorhydria as a qualitative disorder of secretion is due to Riegel,<sup>7</sup> who saw a basis for it in abnormally high HCl values given by the stomach contents after test-meals, together with the absence of gastric secretion in the fasting stomach.

The numerical definition of such abnormally high acidity has always been a source of discrepancy, since the intensity of the subjective manifestations and even their occurrence bear no constant relation to the acidity of the stomach contents, which latter, nevertheless, remained the one essential sign of the disorder.

Riegel in his last paper, whilst admitting that the more recently described alimentary hypersecretion might explain some case of hyperchlorhydria, still maintained the occurrence of this latter as a fundamentally distinct disorder, and gave the following analysis of the stomach contents after a test-breakfast as a typical example.

Volume of contents = 40 ccm. Free HCl, 75. Total acidity, 100.

The special feature being the small volume, the high HCl acidity (the normal values for a test-breakfast being free HCl 20—40, total acidity 40—60), and the considerable difference between the two acidity values.

He regarded free HCl values of 50—60 with a test-breakfast and 60—80 with a test-meal, as an index of hyperchlorhydria.

The values stipulated by others show some variations:—

|                      |   |                                       |
|----------------------|---|---------------------------------------|
| Rosenheim            | - | Total acidity of 60 +, free HCl 55 +. |
| Schüler <sup>9</sup> | - | Total acidity of 70 +, free HCl 60 +. |
| Boas <sup>2</sup>    | - | Free HCl 55 +.                        |

Yukawa,<sup>12</sup> from an investigation of the normal and pathological acidity values in the Japanese, found in hyperchlorhydria total acidity 50–70, free HCl 36–58, the normal values being total acidity 32–52, free HCl 22–42, with the Ewald test-breakfast.

Strauss,<sup>10</sup> on the other hand, based the diagnosis of hyperchlorhydria on certain peculiarities of the stomach contents after a test-breakfast rather than on the acidity values. He found in many cases presenting the subjective manifestations of hyperchlorhydria, that the stomach contents removed one hour after a test-breakfast were abnormally abundant (210 ccm. as compared with the normal 180 ccm. Tuchendler<sup>11</sup>), very fluid, readily separating on standing into a clear fluid and a granular sediment, the volume of the latter after two hours being less than half the total volume. The contents showed deficient amylolysis; a free HCl contents of two-thirds, rarely less than half the total acidity, and in some cases an abnormally low molecular concentration. These peculiarities he explained as due to the rapid inhibition of the amylolytic action of saliva in the stomach by the hyperacid gastric juice, the undigested starch remaining in the stomach and continuing to excite the secretion of gastric juice beyond the normal amount. That the excessive quantity of the stomach contents in such cases was the result of excessive secretion rather than of simple retention from atony of the stomach, and that it was the immediate sequence of inhibition of the amylolytic changes in the stomach appeared from the observation that in such cases the stomach was practically empty  $2\frac{1}{2}$  hours after a proteid test-meal (Riegel's). In thus regarding hyperchlorhydria as essentially characterised by the secretion of excessive quantities of gastric juice after the ingestion of a starchy meal, Strauss approaches the views of Rubow<sup>8</sup> and Bickel.<sup>1</sup> Schüler,<sup>9</sup> continuing the investigation of hyperchlorhydria under Strauss,<sup>10</sup> found that in some cases the stomach contents after a test-breakfast presenting the above peculiarities, had normal or even subnormal HCl values; a type which he designated hyperaciditas larvata or occulta, and which he believed to depend on an early secretion of hyperacid juice rapidly rising to a maximum (as shown by the hyperacidity of the stomach contents, 20–30 minutes after a test-meal) and as rapidly falling, the period of decline being

associated with a transudation of neutral or alkaline fluid from the gastric vessels—dilution secretion—resulting in a diminution of the acidity of the stomach contents to or below the normal at the usual time of investigation, viz., one hour after a test-breakfast.

This condition of larval or occult hyperchlorhydria, being associated with early inhibition of amylolysis, is characterised by (1) the formation of amidulin, (2) excessive quantity of stomach contents, (3) of low specific gravity, and (4) depressed freezing point.

Hyperchlorhydria is thus regarded by Strauss<sup>10</sup> and his co-workers as characterised by the occurrence of a digestive supersecretion with a starchy test-meal, but not with a proteid test-meal.

In 1903 Zweig and Calvo<sup>13</sup> described, under the term "alimentary hypersecretion," a disorder of secretion which they regarded as essentially an excitative secretory neurosis, characterised by the secretion of excessive quantities of gastric juice in response to the taking of food, and only then. From continuous hypersecretion it is at once differentiated by the absence of abnormal quantities (more than 20 ccm.) of gastric juice in the fasting stomach; and from the type of hypersecretion described by Strauss<sup>10</sup> by its occurrence with any form of test-meal—proteid or starchy—and by normal amylolysis, the disorder being the expression of an abnormal irritability of the secretory mechanism of the stomach responding to all forms of digestive stimuli by the secretion of excessive quantities of gastric juice.

The subjective symptoms of alimentary hypersecretion, as detailed by Zweig,<sup>14</sup> are those of nervous dyspepsia; a sense of fulness and pressure in the stomach after food, increasing at times to actual pain, and occasionally occurring during the night with disturbance of sleep. The appetite is variable, generally deficient. Acid eructations are common, but true pyrosis is very rare, as are nausea and vomiting. Besides these dyspeptic manifestations there are not uncommonly headache, insomnia, and irritability. These subjective symptoms show frequent variations, often the individual remains without any discomfort for weeks, and then suddenly all the symptoms appear with great severity. Mental worry and depression exert a marked influence on their occurrence and intensity.

Often these patients show considerable emaciation. A loss



of 20 to 30 lb. in weight is not unusual and may occur so rapidly as to suggest malignant disease ; the cause of this is probably to be found in voluntary starvation from fear of the discomfort induced by the taking of food, rather than in the excessive production of gastric juice and in any disturbance of amylolysis as suggested by Boas.<sup>2</sup> Obstinate constipation is very frequent, and has been attributed to the destruction of the intestinal bacteria by the large amounts of acid juice secreted by the stomach.

In addition, the patients present the objective signs usually associated with nervous dyspepsia, a general feebleness of the muscular and skeletal systems, the acute costal angle, mobility of the tenth costal cartilages, a tendency to enteroptosis, and more or less severe disturbance of general nutrition. The stomach elicits loud splashing even several hours after a meal ; often there is nephroptosis, and in some a marked tenderness of the gastric area on pressure, with dorsal pressure points on both sides of the spine.

The characters of the stomach contents after a test-meal afford the most important diagnostic criteria. That the abnormally large quantity of stomach contents characteristic of alimentary hypersecretion depends on excessive secretion rather than on an undue retention of the test-meal in the stomach may be shown by the use of Sahli's test-meal, employed by Zweig and Calvo<sup>13</sup> in their original investigations ; or, as this method is too complex and tedious for routine clinical work, by the use of the ordinary Ewald test-breakfast, with estimation of the sediment ratio, either by the method of Strauss of allowing the stomach contents to stand in a graduated glass for two hours and then reading off the ratio of the sediment to the total contents ; or by the method of Elsner,<sup>4</sup> in which, first, the total stomach contents is estimated by the Mathieu-Rémond method, then the stomach washed till free of residue, and the stomach contents and washings mixed together are allowed to stand for 24 hours, when the total amount of sediment is read off. Under normal conditions it was found that the total stomach contents one hour after a test-breakfast was 200 ccm., and that the total sediment, after 24 hours' standing, amounted to about 100 ccm., or 50 per cent. of the total quantity. Increase in the sediment without corresponding increase in the total quantity, that is,

an increased sediment ratio, indicates a motor insufficiency ; whilst a marked diminution in the sediment in comparison with the total quantity—a diminished sediment ratio—indicates an increased secretion.

Zweig<sup>14</sup> has further modified the sediment method in that he obtains the ratio of sediment to the whole contents more rapidly by centrifugalising some of the stomach contents in a graduated tube, and determines the total quantity of stomach contents by the Mathieu-Rémond method. In health he found the sediment to be about 40 per cent. to 60 per cent. of the whole contents ; whilst in alimentary hypersecretion it was always less than 30 per cent.

Zweig<sup>14</sup> further asserts that alimentary hypersecretion is also indicated by such diminution in the ratio of the sediment to the whole contents without any increase in the total quantity of the stomach contents, a characteristic which may, however, have another explanation.

For the diagnosis of alimentary hypersecretion Boas<sup>2</sup> introduced what he terms a dry test-breakfast, consisting simply of five Albert biscuits, thus doing away with the complication of the 10 ounces of fluid of the Ewald breakfast.

In cases of alimentary hypersecretion he was able to obtain 100—200 ccm. of contents one hour after such a breakfast, which on standing separated into a granular sediment and a clear or slightly turbid fluid, of three to five times the volume of the sediment.

The acid values of the stomach contents show considerable variations : in 18 cases Zweig<sup>14</sup> found 10 with hyperacidity, 6 with normal acidity, and 2 with subacidity. Riegel<sup>7</sup> regarded a comparatively small difference between the free HCl value and the total acidity, namely 6—10, as characteristic of this condition. He gave the following as typical examples :—

| Total Contents. |   |   | Free HCl. | Total Acidity. | Difference. |
|-----------------|---|---|-----------|----------------|-------------|
| 135 ccm.        | - | - | 66        | 75             | 9           |
| 140 ccm.        | - | - | 58        | 64             | 6           |

Zweig,<sup>14</sup> however, was unable to confirm this peculiarity emphasised by Riegel,<sup>7</sup> the average difference in his cases

between the free HCl and the total acidity being 17.

The specific gravity of the contents is always low, being from 1,007 to 1,012, as compared with the normal 1,015 to 1,020.

Premature inhibition of starch digestion, as shown by the presence of amidulin, occurs only in such cases as show hyperacidity.

On turning to the results of Pawlow's investigations on the secretion of HCl in the gastric juice of the dog, two features—namely, the large percentage normally present (·4 per cent.) and the remarkable constancy of this percentage under different conditions—are difficult to reconcile with the conception of a qualitative disorder of secretion, and particularly when it is recalled that 0·25 per cent. was accepted as the maximum normal content of gastric juice in HCl when Riegel<sup>7</sup> originally described hyperchlorhydria.

The results obtained by the Pawlow school in animals have been established in the human subject by similar methods of investigation.

Hornborg<sup>8</sup> found in a boy, aged 5, on whom gastrostomy had been performed for œsophageal stricture, that the pure gastric juice obtained at the height of secretion had a maximum HCl content of 0·547—0·566 per cent.

Bickel<sup>1</sup> and his co-workers also determined in the case of a female, aged 25, who has been provided with gastric and œsophageal fistulæ (Gluck's artificial œsophagus) to compensate an œsophageal stenosis, that (1) the pure gastric juice contained 0·4—0·55 per cent. of free HCl; (2) the HCl content remained, approximately, constant during the period of secretion, varying between 0·35 per cent. and 0·55 per cent.; (3) the quantity of gastric juice secreted varied within wide limits; and (4) that it was impossible experimentally to increase the percentage of HCl in the juice above the normal limit.

Bickel<sup>1</sup> further sought to establish that any diminution of the HCl was the result of neutralisation either by mucus or by reflux of the duodenal contents, rather than of a diminution in the percentage of HCl in the secreted juice. Saito, however, found that irritation by silver nitrate and alcohol led to a diminution of HCl greater than could be accounted for by



the increased secretion of mucus, and, accordingly, it appeared that a condition of hypochlorhydria might result from defective activity of the acid-secreting cells.

The HCl content of human gastric juice being thus established as 0.4—0.56 per cent. (110—150) it is of great significance, as pointed out by Rubow<sup>8</sup> and Bickel,<sup>1</sup> that the highest acidity values in hyperchlorhydria never exceed the normal superior limit.

Rubow,<sup>8</sup> who was the first to draw attention to this weak point in Riegel's conception, found among 704 cases that even the total acidity never exceeded 125, and that in cases of continuous hypersecretion with hyperacidity, the HCl content of the fluid removed from the fasting stomach (approximately pure gastric juice) never exceeded the normal values.

Rubow<sup>8</sup> accordingly concluded that there was no substantial proof of the occurrence of a genuine hyperchlorhydria, and he showed that the condition of relative hyperacidity of the stomach contents (mixture of food and gastric juice) could in all cases be explained by variations in the amount of gastric juice secreted and in the motility of the stomach. Thus the excessive secretion of a qualitatively normal gastric juice, in response to the digestive stimulus, would, with normal motility of the stomach, be manifest by a relatively large quantity of stomach contents having a relatively high acidity (the greater the amount of HCl containing juice secreted, the higher the percentage of HCl in the ultimate mixture—stomach contents); again, were the motility of the stomach in excess of the normal, the acidity of the stomach contents would be still higher, as the mixture would then contain gastric juice in greater proportion, secreted at a stage when the neutralising influence of the gastric mucus would be relatively small; and in continuous secretion the acidity of the fluid removed from the fasting stomach would, in the absence of the neutralising effect of saliva, gastric mucus, and possibly transudation, be greatest of all, as it would approximate most nearly to pure, undiluted gastric juice.

This view of disorders of secretion, adopted or independently conceived, was further elaborated by Bickel.<sup>1</sup> Variations in the quantity of gastric juice secreted being the essential feature, he differentiates conditions where the juice has a

normal HCl content—euhydrochlorica—and where it has a subnormal HCl content—hypohydrochlorica, the several types of disordered secretion being explained by the occurrence of the hypersecretion in relation to the digestive period.

When the hypersecretion occurs during the digestive period the type of hyperchlorhydria results; when it is prolonged somewhat beyond the normal secretory period, the type of digestive supersecretion; when it occurs periodically with or without relation to the digestive period and with intervals of normal secretory activity—the type of intermittent supersecretion; and, lastly, the type of continuous supersecretion.

The terminology being as yet insufficient to satisfy the cravings of Bickel,<sup>1</sup> he elaborates his views in the following schema.

A.—Supersecretio transitoria (euhydrochlorica : hypohydrochlorica).

- (1) Supersecretio transitoria digestiva simplex.
- (2) Supersecretio transitoria digestiva prolongata.
- (3) Supersecretio transitoria periodica.

B.—Supersecretio continua (euhydrochlorica : hypohydrochlorica).

- (1) Supersecretio continua simplex.
- (2) Supersecretio continua exacerbens.

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## SOME COMFORTABLE WORDS ABOUT POISONING.

By S. SQUIRE SPRIGGE, M.D.

AMID the unbroken laudation of the value of scientific discovery there has grown up, and not only among the nervous and ignorant, a well-founded suspicion that powers able to go so far in certain directions for human welfare may, under the employ of the unscrupulous, prove themselves to be very formidable assistants in evil designs. The adulterator of food is often an expert chemist, the coiner is nowadays an electrician, the possibilities of the motor-car as an adjunct to burglary have been demonstrated, and those of the aeroplane, which laughs geographical and fiscal boundaries to scorn, can scarcely be imagined. And while there are many sorts of rogues and villains to whom science would prove an excellent handmaid, to no one can she appear more useful at first sight than to the poisoner. But when we come to look a little closely at the directions in which the advancement of scientific knowledge might facilitate the poisoner's plans, we see that the apprehension—which is perhaps more marked in France than with us—that secret poisoning is on the increase is groundless, while the celebrated cases, which are here briefly quoted in example of the methods usually employed by poisoners, have all this comfortable feature about them:—the increasing ingenuity of the criminal is met by commensurate skill and knowledge on the side of the law. Which means to say, that scientific development, where criminal poisoning is concerned, makes for security, for the law keeps ahead of the law-breaker. That, at any rate, is the conclusion to which I invite you to come.

What is a poison seems an easy enough question to answer. Common intelligence defines as a poison anything that, being absorbed by or received into the subject, results in bodily harm. Such a sweeping definition has much to recommend it, but it is too vague. On the other hand, it is impossible for any one—the lawyer, for example—to be entirely exact, and to codify all substances into poisons and non-poisons. If, for instance, a host seduces a guest into vinous excess, and there



should be a headache on the morrow : this would not be a case of poisoning within the legal meaning of the term, even though the host should know from common experience of wine, or special knowledge of the quality of his own cellar, that his invitation might lead to such a disaster. Yet, under certain circumstances, alcohol is a poison and a very effective one. Or, again, a man may, as Brunel the great engineer did, under a too literal *auri sacra fames*, swallow a sovereign, and it might stick in his larynx and cause inconvenience ; this occurrence would not erect a certain combination of gold and copper into a poison. These ridiculous illustrations serve to show that, for practical purposes, the definition of common intelligence is too loose, as the poisonous nature of any substance is determined, not by its identity alone, but by other circumstances, notably by its dose, and by its method of administration.

It will be as well to indicate a little more clearly what are the circumstances which are in question and which are considered as constituting a case of criminal poisoning. By criminal poisoning we mean here, as is usually meant where no qualification of the phrase is introduced, the administration of a noxious substance with the intent to kill, and not merely with the intent to inconvenience. This, of course, implies that the crime is done in accord with design and that the substance is selected because of its known lethal qualities. Again, the particular crimes that will be adduced as examples of the methods of poisoning adopted belong in each case to a class of crime that is known as "secret poisoning," the qualification implying that the criminal hoped to escape detection either by concealing the fact that poison had been given or by avoiding the discovery of the person who had given it. For it is only in regard to these forms of poisoning that any precautions, legal or scientific, can be taken. Where the poisoner is absolutely reckless of his own safety, and is, in fact, prepared to be hanged, if only his deed can be accomplished, it is evident that no safeguards can be erected. But this form of crime is very rare, and for all practical purposes may be regarded mainly as a species of suicide rather than homicide. "Secret poisoning," as opposed to such a procedure, includes all cases of criminal poisoning whose

investigation presents any legal or scientific interest; but here again there is room for confusion. The phrase "secret poisoning" is used sometimes to mean one thing and sometimes another. No poisoners, whether the crime projected be a single-handed one or the work of a confederacy, take the outside world into their confidence, and in that way all criminal poisoning, save the suicidal form, where detection is not avoided, is "secret"; but, leaving aside the suicidal form, cases of poisoning may be roughly divided into two classes—a class where the main endeavour of the criminal is directed towards averting suspicion from himself, and a class where the main endeavour is directed towards hiding the fact that the victim has been poisoned. In a thoroughly well-planned crime it is obvious that the criminal would try to maintain both lines of defence. In the first case one may conceive the act of poisoning to be much cruder than it is in the second, while the second form is the crime more strictly called "secret poisoning," of which the public is particularly apprehensive, and in the performance of which it is presumed that the developments of science may assist the malefactor. This is the terrific crime which is justly regarded as the worst offence known to civilisation, for in the category fall those hideous domestic tragedies where the murderer seeks to destroy the near relative to whom he has every facility of access, and on whose deathbed he waits with simulated sympathy. The bloody hypocrisy and bestial callousness that such a criminal displays are made more loathsome by the pertinacity in evil. Other murders, however deliberately planned, are, in the end, sudden; it may be the essence of the secret poisoner's plot that the victim's agony should be long drawn out, so that the gradual sinking into the grave may most resemble death from an ordinary pathological failure. This is the crime most feared by the public, but good grounds are wanting for believing either that it has often been accomplished or that recent scientific developments make it easier to accomplish.

Poisoning in England has been usually rather a crude process. Arsenic, strychnine, hydrocyanic, carbolic, oxalic and certain mineral acids have been the more usual agents, and in none of the cases to which allusion is made have we to con-

sider for a moment whether the medium employed can fairly be called a poison. The quantity administered of these familiar poisons has generally been so entirely enormous, so vastly in excess of the necessary fatal dose, that not only has suspicion been aroused by the violence of the symptoms, but plentiful traces of the poison have been found in the victim's body. So that the following is a fair *résumé* of a typical case ending in conviction of the murderer:—

a. The subject of the crime is taken suddenly and extremely ill.

b. He dies with signs and symptoms that accord with those produced by the administration of a well-known drug.

c. This drug is found in his body after death, and

d. Possession of it is traced to the suspected person.

If now the suspected person can be shown to have any reason for desiring the removal of the victim the story is complete. In such a case, which is a fair example of the most frequent kind of poisoning, it will be seen that the one safeguard of the public is the ignorance of the poisoner. It is his ignorance that leads him to employ the usual agents, for he knows of no others; and it is his ignorance of their physical consequences that leads him to administer them in the grossly unskilful manner that ultimately leads to his detection.

Poisoning conducted on these lines, however secretly the criminal may have intended to carry out his design, resembles the action of the wife-basher, who attacks his victim with a poker; and it is obliging of our poisoners to employ as a rule a medium which is as obvious as a poker, and with it to inflict mischief which is as patent to inspection as a smashed-in skull. For the injuries which follow poisoning as usually performed are nearly as gross as those accompanying a fractured skull, while it is as easy for those who know to find an overdose of undigested poison in the victim's stomach as it is to pick up a bent and bloodstained poker from the hearth-rug. The wife-basher, however, is aware of the obviousness of his crime, and generally makes no attempt to escape the consequences of his action, beyond pleading that he was drunk or that a nagging woman had tried him too highly—he knows he cannot explain away the poker; but the poisoner always hopes that the effects of his deed may simulate a natural



illness.

If we look at a few famous cases of poisoning we shall see how closely the earlier ones fit, in their coarseness of conception and execution, with the summary which has been given of the usual events. Such cases form only a proportion of those that occurred, for the resources of the law before the days of chemical knowledge, and when there was no system of death-certification, were very meagre. I make no attempt to give the full stories of notable poisoning tragedies ; these can be found in the *State Trials* or the *Annual Register*, I propose only to mention the salient features of a few cases in support of the proposition that the more elaborate murders by poison, such as scientific developments might prepare us to expect in these days, carry with them enhanced risks to the criminal. The earlier criminals were hanged because they were ignorant, not because the law was clever ; indeed, so futile were the ancient legal proceedings that it is more than probable that in the seventeenth and eighteenth centuries many able villains escaped punishment for murder by poison. Nowadays, ability does not serve the criminal so well ; the poisoner is more learned, but the safeguards are vastly greater.

The case of Mary Blandy, who was tried at Oxford in 1752, for the murder of her father with arsenic, created enormous excitement, and in some of its features bore a marked resemblance to the famous Maybrick tragedy. Dr. Addison, the physician who attended the deceased, showed himself to be far in advance of his time, and his mode of procedure might form a useful example to family practitioners at the present day, when they are impelled to the sinister theory that the patient, whom they have been summoned to attend is the victim of a murderous attempt. He found the patient in bed when he was first called to him, on a Saturday, and was informed by him that, after drinking some gruel on the night of the previous Monday—that is, five or six days before—he perceived an extraordinary grittiness in his mouth. Painful intestinal symptoms developed and were relieved, but returned on the following night again after drinking some gruel. He compared his pains to an infinite number of needles darting into him all at once, and stated that they came on almost immediately after taking the gruel. Dr. Addison had been supplied with a story by the patient's

daughter, attributing the symptoms to natural colic, with which they fitted in some respects, but in others they were abnormal. He made up his mind that he might be dealing with a case of poisoning, and faced the appalling situation that suspicions could only fall upon the unfortunate man's daughter. He confined the daughter to her room, confiscated certain porringers of gruel and tea which had been prepared by her, discreetly cross-examined the servants and even the dying patient, and supported all his actions by associating another medical man with him in the conduct of the case. Poor Blandy lived three or four days in dreadful agony, but showed in his lucid intervals that he shared the suspicions of his doctor, and the daughter was arrested for murder on his death. Arsenic was found in the deceased man's gruel and tea, arsenic was traced to the girl's possession, and evidence was forthcoming to show that the attempt at poisoning had begun with her engagement to the man who supplied her with the drug. This man was not indicted, presumably because he was believed not to be a willing accomplice; but Mary Blandy was hanged on circumstantial evidence. She confessed to administering a powder to her father, but declared that the nature of the powder, which had been sent her by her lover "to clean Scotch pebbles," was unknown to her, and protested her innocence to the end. Reading these bald sentences it may be said that no diagnosis but poison was possible, and that particular eulogy of Dr. Addison is unmerited, as he only took an obvious course in the clearest of circumstances. But, as a matter of fact, his action was very commendable, for he adhered to what could only be suspicion after very plausible explanations had been offered of the victim's condition. The rough chemistry of the day gave him no sure assistance, no elaborate text-books described the symptom-complex of arsenical poisoning, and probably he had never seen a case of the kind before. But he acted on his judgment of the probabilities, and at once the mystery began to clear up. His knowledge of medicine would not allow him to consider the story of colic as a satisfactory explanation of the signs and symptoms of the case, while his conscience forbade him to shrink from the alternative of accepting that information. The story fits exactly with the *résumé* given of a typical case of poisoning by an unintelligent criminal. There was the poison

given in such large doses that its effects could be definitely traced to a particular food, and there was the palpable remnant of the poison in that food. The same poison was traced to the criminal, and a motive was forthcoming. But 150 years ago the crime was not as infantile in its simplicity as it now seems to us, and Mary Blandy might easily have escaped punishment—would in fact almost certainly have escaped it—had it not been for Dr. Addison's instinct and courageous adherence to the view which that instinct prompted. There were no Poison Acts in 1752 and no system of death-certification. This means that no record of the obtaining of poison by Mary Blandy or by any accomplice would necessarily have been forthcoming, while, if Blandy had died, there would have been no difficulty in accepting his daughter's suggestion that he had died of colic. Severe colic, and even cholera, much resemble arsenic poisoning; indeed, no less a person than Sir Samuel Wilks has said that arsenic poisoning and cholera are often identical in appearance. In the middle of the eighteenth century the crude poisoner had a good chance of security, for no one could have been cruder than Mary Blandy, and yet she was unlucky not to have gone scot free.

We advance a step when we come to Captain John Donellan, who was indicted about 30 years later—that is, in March, 1781—for the murder by poison of his brother-in-law, Sir Theodosius Boughton. Sir Theodosius Boughton, who at the time of his death was within a few weeks of his 21st year, resided with his mother, the Dowager Lady Boughton, his sister, Mrs. Donellan, and her husband, Captain John Donellan. On the 30th August 1780, which was a Wednesday, a manservant went into his young master's bedroom at 6 a.m. to get some straps. Sir Theodosius jumped from his bed to fetch them for him out of the next room; he was then in his usual good health, save for a small local ailment. He got back to bed again, where his mother found him when she went to his room at 7 o'clock to give him some medicine. This medicine was a draught made up by the family apothecary, containing presumably the following:—rhubarb and jalap, 15 grains of each; spirits of lavender, 20 drops; nutmeg water, 2 drachms; syrup, 2 drachms, and an ounce and a half of water. These ingredients had been put by the apothecary into a two-ounce phial, which was given to a manservant, who gave it



in his turn to Sir Theodosius Boughton, who put it on a table in the hall of the house. There would naturally be in this draught a certain amount of sediment and of liquid. Lady Boughton in her evidence at the trial described how she first read the label on the bottle and then administered the draught to her son, noticing that it had a strong smell of bitter almonds. Immediately on swallowing the draught the unfortunate lad complained of sickness and in two minutes he was convulsed, dying in about half an hour without speaking. By his death Mrs. Donellan inherited an income of about £2,000 per annum, in which her husband had a life-interest. Donellan drew suspicion upon himself from the first. He went into the boy's bedroom and rinsed out the bottle containing the rest of the draught; he affected to find evidence that the death was due to cold; at the same time he confided to a neighbouring magistrate his reasons for thinking that the death had a totally different cause. If he had not behaved in this way he would probably have been quite safe, for every one in the house believed that Sir Theodosius's death was due to an error in dispensing on the part of the apothecary. Sir Theodosius, not being of age, had a guardian, Sir William Wheeler, and this gentleman now appeared on the scene with a suggestion that the body should be examined by two medical men whom he named. Donellan, as master of the house, acquiesced cheerfully, but was foolish enough both to prevent the post-mortem examination from being made and to pretend to Sir William Wheeler that it had been made with negative results. The body was then buried, but loose surmises had crystallised, owing to Donellan's clumsiness, into a solid suspicion that there had been foul play. An exhumation was ordered by the coroner, and a verdict of wilful murder was returned at the inquest by a jury who were offered no scientific evidence, but who arrived at their opinion as a deduction from Donellan's own behaviour. Donellan was immediately arrested. At the trial some extraordinary circumstantial evidence was forthcoming. It was elicited that Donellan possessed a small still and could have distilled laurel leaves; that he had easy access to the draught before it was administered to his brother-in-law, but after it had left the apothecary's hands; that he washed out the phial containing the draught; and that he had in a sort of way warned Lady

Boughton of an impending tragedy. He knew which morning the draught was to be given and planned that he and Lady Boughton should be away from early morning throughout the day ; and, if this arrangement had not been upset by Lady Boughton's personal administration of the poison before starting, the unfortunate lad's death would have probably taken place unseen, and such evidence as there was of poisoning would not necessarily have been connected with the draught. These things, coupled with his untruthful versions of the cause of death, his resolve to get the body buried without inspection, and his large pecuniary interest in his brother-in-law's death turned the scale against him. Of scientific evidence there was hardly a trace, and Donellan's resistance to Sir William Wheeler's demand for a post-mortem examination was idiotic, for the chemistry of the day would have discovered nothing, while any abnormality of any organ that might have been present would have furnished some grounds for defence. The four medical witnesses for the Crown laid stress on the absence of all signs and symptoms of disease as a proof that death was due to poisoning, but the post-mortem investigation after the exhumation was a very perfunctory one. The witnesses had made some experiments upon animals, and partly as the result of these, but mainly because of the statement of Lady Boughton that death from convulsions succeeded almost immediately upon the ingestion of a draught smelling of bitter almonds, they concurred in attributing the death to a poisonous distillate of laurel leaves. Donellan called to his aid the father of modern surgery, John Hunter, whose suggestion that death might have been due to epilepsy or apoplexy was a surprising piece of expert evidence. But it carried no weight, for the great naturalist had to admit that all the symptoms agreed with prussic acid poisoning. So the witnesses for the Crown prevailed, but Donellan hanged himself every whit as much as Mary Blandy hanged herself. The circumstances ensured that Donellan would be suspected, but he would not have been convicted if he had known the measure of his security, for he would have made no contradictory and foolish suggestions as to Sir Theodosius's state of health, and would have offered no resistance to a post-mortem examination of the body.

We now skip 60 years and more, and come to the famous Salt Hill murder, which is a good type of that form of poisoning

where the poisoner does not try to conceal the cause of the victim's death, but hopes that he will be in no way connected with the crime if and when it is discovered. The quantity of prussic acid given here was so large that death occurred with the same terrific violence that might have followed upon a blow with a cudgel or stab with a knife. The prisoner, John Tawell, "the Quaker," as he was generally called, was indicted on the 12th March, 1845, for the wilful murder of Sarah Hart on the 1st January of that same year, by poisoning her with prussic or hydrocyanic acid. The deceased woman lived at Bath Place, Salt Hill, near Slough, her residence being one of a row of small four-roomed cottages. One evening her next-door neighbour heard some curious noises in the cottage occupied by the deceased, the partition wall being very thin. The noises continued, and took the form of moans or stifled screams. She was much alarmed, and, taking a candle, she left her house and went down the garden into the high road. At this moment, and while the groans were still audible, a man dressed like a Quaker, whom she had seen entering Mrs. Hart's cottage two hours before, came out of the cottage. As he reached the garden gate she enquired what was the matter in Mrs. Hart's house, but the Quaker, who made no answer, hurried off. She entered the cottage and found Mrs. Hart moaning on the floor. She fetched a medical man, but Mrs. Hart died a few moments after his arrival. This medical man, a Mr. Champneys, had, however, the right detective instinct.<sup>1</sup> He suspected poison, and persuaded the rector to go to the railway station to ask whether a strange man, dressed like a Quaker, had taken a train to London. The clergyman arrived on the platform just in time to see a man in Quaker's garb enter the London train; it was Tawell who, after hanging about the Eton road for some time in indecision, had decided to return to London. The telegraph communication between Slough and London had just been made. The police at Paddington were put on the track of Tawell, who was arrested on the following day and subsequently convicted of murder on the clearest evidence. He was shown to have purchased prussic acid on the day of the crime, to have entered Mrs. Hart's house two hours before

<sup>1</sup> For the story in detail, and very gruesome detail too, *The Lancet*, Vol. I., 1845, may be consulted.



her death, to have left a few minutes before her death, to have lied about all his movements during the day, and to have forcible reasons for desiring to get rid of his victim.

The post-mortem examination, not held as a matter of chance, but a formal procedure provided for by the Death Certification Act of 1836, proved the presence of prussic acid in the stomach, and the terrible story was complete. Here we have a distinct improvement of the criminal's chances more than counterbalanced by the resources of law and order. I reckon as an accident that the victim belonged to the class which enjoys the least security (for the relations between Mrs. Hart and Tawell were of the sort which neither would seek to advertise), while it was also an accident, sensational enough it must be granted, which placed in the hands of the law the power of telegraphy almost for the first time on the very day of the crime. The essential differences between the proceedings which convicted Tawell and those which brought home the crime of poisoning to Donellan and Blandy go to prove a solid advance in the machinery for the protection of the public. The post-mortem examination of Mrs. Hart was conducted in accordance with a proper chemical routine, methods for the detection of prussic acid in the body and the estimation of its quantity being now possessed by the medical profession. The medical men no longer, as in the case of Sir Theodosius Boughton, gave an opinion of the cause of death based upon what other persons—and those laymen—had seen of the victim's last moments. They suspected poisoning by prussic acid because of the various symptoms, and then proved its presence in the unfortunate woman's stomach. The railway, on the other hand, offered facilities for crime which had not been taken advantage of before, in that it allowed poison to be purchased at a distance from the seat of operations, and provided a speedy retreat for the murderer, with the possibility of setting up an alibi. The happy activity of the doctor and the clergyman and the alertness of the police at Paddington served to arrest Tawell; the discovery that he was an ex-convict who had led an evil life prejudiced his defence; but the scientific evidence hanged him.

Moreover, the General Registration Act (6 & 7 Will. IV., c. 86) had now been ten years in action. It is droll to be praising our system of death-certification, which is notoriously

inadequate in many respects, but we have to remember that the first Act providing for the certification of births, deaths, and marriages was an enormous social step forward. Murder, and perhaps especially murder by poisoning, was rendered much easier by the absence of such legislation, and it is impossible not to believe that many tragedies may have escaped notice before the passing of the General Registration Act, because no account had to be given of the cause of death. Death-certification, which became the law of the land in 1836, compelled the supplying to a Crown official of information concerning a death before burial could be effected, for which purpose in cases of sudden or mysterious death a medical man had very usually to be called in or a coroner's aid invoked. Poor young Boughton, for instance, could never have been buried without inquiry had even the rough-and-ready system of certification provided by the first Act been in force. Three causes were alleged by Donellan for his brother-in-law's death, and a medical man must have been asked to decide between them, and must have found that he could not certify the exact cause or permit burial without adequate inquiry. The coroner's inquest would have followed as a matter of course. Death-certification is a distinctly comfortable thing to remember in connection with murder by poisoning. The present machinery to that end may, and does, require amendment, but such as it is it brings the prisoner into relation, in most cases, with the authorities, when it will be found that the scientific knowledge at the disposal of the law is probably superior to that displayed by the criminal.

The cases so far selected for notice, which all occurred between the middle of the eighteenth and the middle of the nineteenth century, show fairly well that the resources of science kept ahead of the resources of crime in those cases. The ingenuity of the criminals increased, but the working of the law was strengthened by the spread of learning. An increased knowledge of social needs had brought about death-certification, and an increased knowledge of pathology and toxicology had made the post-mortem examination of those who had died under suspicious circumstances a genuine investigation, in the course of which the true cause of death could be in many cases arrived at and demonstrated upon oath to a jury. It is not possible to make the inference that the

amount of secret poisoning had once been great, and that the conviction of Blandy and Donellan had a deterrent effect ; but it is certain that such crimes as they two committed would not have escaped detection under the more perfected machinery of the law which was marked by the Death-Certification Act.

The apprehensions, however, that the poisoner may get ahead of the scientific expert, may in fact himself use all the resources of science in a successful manner, become stronger as we approach more modern times, and in particular have been aroused by the crimes of four notable miscreants who belonged to the medical profession, and who used their knowledge acquired in medicine to perform their terrible deeds.

These four were William Palmer, Edward Pritchard, George Lamson, and Thomas Neill or Cream. Tawell has a connection with this group, for in the character of a ticket-of-leave man he had been a druggist in Australia and the fact enabled him to order poisons in a manner that attracted no suspicion. For the same reason these four persons had no trouble in obtaining the poisons wherewith to carry out their monstrous designs, though they varied much in the skill of execution which they displayed. The merest outlines of their crimes will suffice for our purpose, the columns of *The Times* and the scientific summaries in *The Lancet* can be easily consulted by any one who wants more details.

William Palmer was hanged for murder in the summer of 1856. After a short apprenticeship to a firm of druggists, which was terminated in a manner discreditable to himself, he became a student at St. Bartholomew's Hospital, and ultimately House Surgeon at that institution. He then went into practice at Rugeley in Staffordshire, where he had family connections, but soon deserted his profession for horse-breeding and betting on the turf. Thus he became acquainted with John Parsons Cook, a young man who was engaged in getting rid of a small patrimony by gambling, and who died in a suspicious manner at a hotel in Rugeley after taking medicines and food which had been either prepared for him by Palmer or which had been through Palmer's hands. Palmer was arrested and the Crown proposed to prove that he had murdered Cook by administering strychnine, while the defence was that Cook had died of epilepsy or tetanus or angina pectoris, all conditions attended with muscular contractions, but differing widely



n history and symptoms from each other, without in any case agreeing at all well with Cook's dying condition. The circumstantial and the scientific evidence and the skill with which these were marshalled against him by the Attorney-General, Sir Alexander Cockburn, between them hanged Palmer, whose tribute to the share in the result due to counsel—"It was the riding that did it"—is one of the bravest pieces of cynicism on record. Palmer was proved to have purchased strychnine on two occasions just before the death of Cook, whose dying manifestations exactly agreed with strychnine poison. Palmer gave no reason why he required the strychnine, nor could he produce any of it. After he purchased the strychnine he gave pills to Cook which appeared to produce the fatal convulsions. Palmer was in dire need of money to avoid prosecution for forgery, and had robbed Cook by methods which Cook must have discovered in a few days, had he been alive. The medical evidence in favour of death being due to strychnine was very strong, while the medical evidence attributing the death to different natural causes was weak and contradictory. But the prosecution had one great difficulty to face. No trace of strychnine was discovered at the post-mortem examination. Antimony, however, was found, and the theory of the Crown was that the crime had been attempted with both poisons, and that certain careless procedures in the performance of the autopsy had prevented the detection of the strychnine. This probably was the just explanation, and it was fortunate for society that the medical evidence and all the attendant circumstances left no room for doubt of Palmer's guilt, otherwise the failure to detect strychnine in the body at the autopsy might have made a jury reluctant to convict. Palmer himself believed that this fact would lead to a disagreement among the jury, and exactly summed up the situation when he attributed the verdict to the "riding," that is to say, to the masterly manner in which the Attorney-General leapt over the gap in the evidence. On the public the impression produced by the published accounts of the trial was a tribute to the widespread belief that Palmer's criminal ingenuity knew no bounds. He was supposed to have discovered some baffling way of administering strychnine so that it should leave no material traces of its presence. Quite sober accounts of the Rugeley crime attribute a mysterious knowledge of poisons to Palmer, but this is mere imagination

In sensational fiction it is enough for the villain to have been a medical student to qualify him for the part of a secret poisoner of transcendent ability, one who will prepare you things in a private laboratory with a steel mask over his face which baffle the analytical powers of the finest chemists ; but in real life the education of a medical man does not equip him as a toxicologist. And Palmer was not a scientific medical man. The failure to find strychnine in Cook's remains was an accident due to the faulty technique of the autopsy and not to any subtlety of Palmer.

Some ten years later, that is to say in the summer of 1865, came the famous Pritchard poisoning case. Like Palmer, Pritchard was a duly qualified medical man, and like Palmer, also, he at no time enjoyed any large private practice or showed any aptitude for his profession. The difference between the two men was that Palmer never made any pretence to more than ordinary medical knowledge, abandoned practice almost at the outset of his professional career and depended upon betting and his small horse-breeding establishment for his support ; whereas Pritchard on resigning a commission in the medical service of the Navy attempted violently to pose as a man of high biological attainments. His crimes were more elaborately conceived than Palmer's, and he is generally placed above the Rugeley murderer for sheer villainy owing to the fact that he was convicted of the double murder of his wife and mother-in-law ; but Palmer, as a matter of fact, had murdered his own brother before he murdered Cook, so that the question of pre-eminence is a little doubtful. Pritchard was in medical practice at the time that he committed his murders, and particularly in the case of his wife he employed a very complicated method of procedure. For although large quantities of antimony were found in the bodies of both his victims, an uncommon stock of other poisons, uncommon for any practitioner whatever the scale of his legitimate operations, was traced to his possession, and it is probable that aconite, chloroform and atropine were at different times laid under contribution, singly or in combination. Pritchard was, in fact, an ingenious poisoner, and he contrived the dosage so as to give colour to certain theories of death from natural causes. In the case of his first murder, that of his mother-in-law, he had no difficulty with regard to the death-certificate ; but

in the second case he had to give the certificate himself, and this was the circumstance which brought him within the grasp of the authorities. Palmer was more fortunate, as in both his crimes he found a brother practitioner willing in the most innocent and ignorant manner in the world to certify death from natural causes. Pritchard's crimes caused general and public terror, but, so far from there being a reason for increased apprehension as to the possibilities of secret poisoning, there should have been a feeling of relief that the developments of accurate scientific procedure were more than keeping pace with the increased facilities for crime. Pritchard belonged to a profession which gave him easy access to drugs, he poisoned with ingenuity and determination, but the safeguards erected by society proved sufficient. One small point of comparison between the circumstances which led to the execution of Mary Blandy and those which led to the execution of Pritchard does not wholly redound to the credit of the medical profession. In 1760 the medical man who first saw Blandy's victim, having in spite of all attempts to draw him off the trail become suspicious that he had to deal with a case of poisoning, took immediate means to verify his suspicions and, if possible, to protect his patient. He gave no thought to the extreme inconvenience that might accrue to himself if he had fallen into error. In the case of Pritchard's crimes the same medical man was called in both to the second poisoning case and to the first poisoning case, and his suspicions being aroused with regard to the second case he refused to be associated with the treatment. He does not appear to have said a word to Pritchard as to these suspicions although the possibility is that by doing so he would have saved the life of the second victim, while by putting the police in motion he would have brought the first crime home to its perpetrator. Where the eighteenth century medical man faced the position bravely, the nineteenth century medical man shirked his responsibility, and at the same time damaged the prestige of the whole of his profession by alleging, as an excuse for his conduct, the dictates of "medical etiquette."

With the next murderer selected for notice we make a distinct step forward. Both the crime of George Lamson, who was tried in 1882 for the murder of his brother-in-law, Percy Malcolm John, and the methods employed in its



detection were on a higher scientific plane. Lamson's crime did indeed justify the question whether the developments of science might not, by removing the safeguards which protect us, elevate the poisoner into the position of a real enemy to society. He selected a rare alkaloid, aconitine, as his medium, and all the circumstances of the crime were planned to make the death appear a perfectly natural one. He gave the dose enclosed in a capsule with some white sugar. He chose his time wisely, for young John, a boy in delicate health, had just made a plentiful meal of the sort that might well be expected to induce acute indigestion. Some hours after swallowing the capsule the unfortunate lad died. Lamson had completed a medical education, and was familiar with the ordinary processes of an autopsy, and he thoroughly believed that the fraction of a grain of an alkaloid, for which there was no chemical test, would escape post-mortem detection, especially when mixed with the contents of a full stomach. He believed, in the first place, that the symptoms of poisoning would go unrecognised, and, in the second place, that, should the death-certificate be withheld, the agent that he had selected would defy chemical research. But the beliefs were ill-founded and this fortunate result is so likely to be the usual issue of poisoning with rare alkaloids that, in seeing how it was brought about in this case, we shall be able to appreciate what are our safeguards against the criminal use of elaborate developments in the art of chemistry. Lamson was a duly qualified physician, by convention an expert in drugs, and by law in a position to obtain possession of deadly poisons with ease—a privilege, by the way, that is known to be largely shared with the medical profession by the public at large. He chose a poison the dose of which was excessively small, the chemical tests for which were unknown, and the symptoms of which were obscure. Indeed, aconitine had only once previously figured in public as a cause of death, so that its effects were necessarily a secret to most men—medical or lay. The ordinary post-mortem examination revealed no cause of death. So far all went well with Lamson and so far his expert knowledge stood him in good stead as a secret poisoner; but the fact that an autopsy was made shows us that the circumstances of the death, though they might well be natural, were not explicable on the surface. The symptoms were too violent

to be attributed to an ordinary gastric disturbance and an investigation was started with the view of proving that the boy had been murdered by an irritant poison. The clue was obtained by a few words of dying complaint in which the unfortunate lad alluded to some peculiar sensations in his mouth and throat. The suspicion thus aroused was confirmed beyond a shadow of doubt by scientific evidence from two sets of experiments, undertaken by expert chemists firstly upon themselves, and secondly upon living mice, by injecting them with the alkaloidal extract of the victim's stomach. This alkaloidal extract produced manifestations that are always associated with the use of aconite, while the symptoms of aconite-poisoning more or less corresponded with those which the moribund lad had described. Again, the alkaloidal extract killed mice in certain times and with certain signs, which were demonstrated to be identical with the times and signs when the same little animals were killed with solutions containing aconitine of known strength. These facts were submitted by the Crown at Lamson's trial as proof that the boy had died of aconitine poisoning. Montagu Williams, in an able defence, did his best—which in that line was far in excess of anybody else's best—to argue and laugh the method of proof out of court, but the scientific men, the late Thomas Stevenson and August Dupré, were too strong for him. The theory put forward for the defence was very interesting, in view of its indication of another and terrific form of poisoning. It was suggested that the alkaloidal extracts which proved so fatal to mice might have contained ptomaines, the result of cadaveric change. The view made no impression because, as it happened, the body was not decomposed. It was freely admitted by the Crown that there was no known chemical test for the vegetable extractive aconitine, but it was claimed, and the jury allowed the claim, that the analysts had demonstrated the extreme probability, almost the certainty, of their views. Then it was proved that the prisoner had bought aconitine in more than one place, had tried to buy it in others, and had in great probability attempted to administer the drug before. Personal advantage was shown also to accrue to him by the death of the lad, for as in the case of Donellan, a valuable reversion accrued to

the murderer on the death of his brother-in-law.

Here was a man of scientific attainments and medical knowledge who chose his poison and chose his time, but failed to secure immunity from punishment, and the comfortable lesson from the story is that similar failure would generally follow similar attempts. Lamson was hanged, and the reason was his ignorance. Ignorance still, though only comparative ignorance. He knew more than those around his victim, but not so much as the really learned. That is to say, when once suspicion fell upon him, his science became of no avail, for more scientific people than himself were arraigned against him.

What was the measure of chance that suspicion should fall upon him? For it constitutes the measure of danger to the community that such a person is likely to be, since, once suspected, he is almost certain to be detected owing to his comparative ignorance. These are the circumstances which give the public a good chance against the scientific poisoner; they are the circumstances which led to Lamson's failure and execution, and which possibly have given pause to some who would emulate his exploits.

(1) The scientific poisoner using a rare drug is using an agent of which generally he can know little, for the individual experiences of one man concerning a drug amount to nothing. If he employs a drug which is rare enough to have a good chance of baffling detection supposing a post-mortem examination is made, it must be one of which he himself, in common with everybody else, is comparatively ignorant. Hence the chance is great that he will give an overdose, and by producing sudden symptoms arouse suspicion of foul play. Then, scientific man though he be, his proceedings may be as crude as those of the wife-basher. Lamson, taking him as the best example of the scientific poisoner, was clumsy in his dosage, and drew disastrous attention in consequence to the fact that he had administered the fatal capsule.

(2) Lamson might have carried his scientific ingenuity further and perfected himself by experiment before venturing on his crime, and any other scientific poisoner might do so likewise. But even so he would find great difficulties in his



way. Experiments on animals can only be conducted with certain formalities, in certain places, and under due licence. Assistance is generally needed for carrying them out in such a way that their results shall be trustworthy. These things would dreadfully embarrass a would-be secret poisoner.

(3) There may be difficulty in obtaining the drug, when its purchase will attract pointed attention, even though the purchaser be a medical man. The professional use of rare alkaloids is not common.

(4) The plea of accidental death cannot be set up with any show of plausibility where a rare alkaloid has been used, as it can where the agent has been some common commercial product, used in the household offices for scouring or vermin-killing, or one that is known to be the chief ingredient in popular hair-dyes or complexion washes. The person who dies of aconitine does not die by any common or easily explicable accident.

It would be a bold generalisation from the consideration of the crimes of Palmer, Pritchard, and Lamson to say that chemical developments in poisoning are not likely to produce an increase in the number of secret poisoners, but the murder of Percy Malcolm John is a very good example of the kind of crime concerning which the public is naturally apprehensive, and the subsequent execution of his vile relative may well be believed to have acted as a deterrent. Lamson chose the best possible agent for his purpose, namely, a little known vegetable alkaloid. In favour of secret poisoning by vegetable alkaloids we have the smallness of the fatal dose, the obscurity of the symptoms produced, and the impossibility of obtaining chemical proof of the presence of the alkaloid in the body. Against these we have the difficulty of obtaining the drug, the notoriety that will attend the purchase, and the impossibility of any question of accident or suicide being seriously considered by the jury. There is also the difficulty of determining the dose in the absence of laboratory facilities. All this seems to me to imply that the successful secret poisoner, the person who might sin and sin again without much risk of detection, would have to be a learned professor with a teaching appointment. There are not many of these valuable citizens in this country where

educational endowment is still scanty, and surely no large proportion of them is indulging in homicidal mania. Yet to me it seems likely that their number expresses the public risk of secret poisoning.

A fourth medical man is here introduced merely to complete the category, Palmer, Pritchard, Lamson, and Neill or Cream being the four last medical men in this country to suffer the extreme penalty of the law for poisoning. If any lesson is to be drawn from a consideration of such murders it is clear that the lesson will have much greater force if no selection be made of the cases. What I desire to show is, that the public runs no especial danger from poisoning by scientific persons, and the typical persons to take as presumably possessing a knowledge of drugs are members of the medical profession. Thomas Neill or Cream, who had some low-grade American medical qualification, actually poisoned five or six persons before he was hanged, so that the justice which a science superior to his own was able to secure for him may seem to have been too tardy to be efficacious. But the circumstances of Cream's crimes were very peculiar, and they could have been equally well perpetrated by a layman. The particular act for which he was hanged was one of a series of murders which he committed in a short space of time by methods which did not offer any particular difficulty of detection, but which showed him to be a wild beast preying on a section of the public whose behaviour makes it almost impossible to protect them by any legal measures against any outrages. The character of Cream's victims must be taken into consideration, when we at once see that the public as a whole runs no risks from similar miscreants, while remarkable ease characterised the commission of his crimes. Cream's victims were low-class prostitutes who had no personal acquaintance with him until he accosted them, who lived under furtive conditions in hired rooms, where little was known of them or their acquaintances, and where they received their clients with little desire for publicity on either side. There is practically nothing to stop a murderer from committing his crime in such circumstances, and but little to trace him by when the crime has been committed, as has been shown over and over

again when an unfortunate girl of this sort has been done to death. Cream was a wild beast, but he had no intention of laying down his life to satisfy his blood lust. He selected, as did the monstrous Whitechapel murderer, the most defenceless class of all society as his victims, and he would never have been arrested if an impudent belief in his security had not led him to attempt the blackmail of a distinguished physician whom he threatened to accuse of the murders. In his case the essence of the crime hardly resided in the fact that he had employed poison as an instrument, for he might with equal impunity have employed a knife or a club. A knowledge of drugs served his shocking purpose, but was only incidental to and not essential to his crime, and no scientific subtlety on his part would have made him a more dangerous foe to society.

A terrific suggestion has been made by more than one writer that the results of bacteriological research might furnish the medical poisoner with the means to afflict his fellow-creatures with mortal illnesses, but the fears expressed have generally carried their own refutation, while they have been inspired obviously by a more than usual capacity for swallowing marvellous stories. But the question has been seriously asked—What is to prevent the scientific poisoner from infecting his victim with ptomaines or with the germs of fatal diseases? The suggestion has only to be considered to be dismissed as ridiculous. It is true that in certain infectious diseases of a dangerous, even deadly, character, the existence of minute living organisms which probably stand in causal relation to the diseases has been demonstrated. More—the discovery of a specific *contagium vivum* in connection with several of the fevers has led to the conclusion that an analogous cause is present in all the other fevers. Here then seems a mighty opportunity for the poisoner! He has only to infect his victim with the specific germ to inoculate him with a deadly disease. What risk does he run? At first sight it would seem that this is a method of poisoning made possible by the processes of science, which should bid defiance to detection. The story of such a case would be in direct opposition to the story of the typical case of poisoning by



drugs, such as has been already narrated in several of its commonest forms. The subject would not be taken suddenly extremely ill, unless he chanced to be infected with one of those fevers where invasion is very abrupt. He would die with signs and symptoms according with those produced by a well-known natural disease, from which natural disease, indeed, he would have suffered. The autopsy would either prove negative in result, or reveal the presence of the well-known natural disease. Why should suspicion be aroused? Why should the necessary death certificate be withheld? The safeguards of the public are here really as efficient as in poisoning by drugs, though they are of a somewhat different character. It is the act of poisoning that is so hard here, and that will always remain so hard, that secret poisoning by means of germ-inoculation need never be seriously feared. To all but an extremely limited class of persons such a crime must be quite impossible. Much technical knowledge and manual dexterity go to the making of a bacteriologist, and this fact has escaped the notice of those who think that because specific germs can be isolated they can be readily obtained in an active state by anyone with access to a laboratory, and that the process of inoculation can be secretly performed and with no trouble.

Poison by inoculation of specific germs is well-nigh impossible. I have alluded to it because, like the highest developments of poisoning by drugs, it could only be attempted by a person with the resources of a laboratory behind him, and I must repeat that such persons are not very numerous, and that the proportion of them who are murderers is very small.

Everything goes to show that the poisoner of the future will not be a very dreadful person, at any rate, will not be a more dreadful person than the poisoner of the present, unless we credit in the future all the scientific acumen to the villain, and none to those engaged upon the side of justice. For this one dilemma will always remain to the poisoner—if he is ignorant entirely, sheer ignorance will hang him; while, by as much as he knows anything, by so much will he be a marked man, upon whom suspicion will fall.



ANCIENT SUPERSTITIONS THAT STILL  
FLOURISH.

By F. H. PICKIN, M.R.C.S., L.R.C.P.

A NUMBER of superstitious beliefs are still to be met with both in town and country practice, usually among the poorer classes. Some of the examples given here I can myself vouch for as they have been experienced during a nomadic career as "locum tenens"; others were related to me by the medical men in whose practice they actually occurred. The interesting points about them are that they happened within recent years, and that they are all true. I have suppressed the names of the towns and villages in which these things occurred, because many of the individuals referred to are still alive, and such people do not welcome ridicule even in the interests of science.

There are many superstitions connected with childbirth. I have at different times been made acquainted with the following simple methods of foretelling the sex of the child during pregnancy :—

1. If the chief prominence of the abdomen is high towards the end of pregnancy, the child is a male; if low, a female.
2. If the abdomen is more prominent when viewed from the side, there is a boy; but if more prominent when viewed from the front, a girl.
3. If, when a woman has given birth to a sequence of boys (or girls), there is a change in the usual course of events during her pregnancy (*i.e.*, if she suffers from vomiting when she has not done so before, etc., etc.) it forebodes a change of birth and the child will be a girl (or boy).
4. If towards the end of pregnancy a drop of secretion is squeezed from the breast into a glass of water and it sinks, there will be a boy; but if it spreads out and floats upon the water, there will be a girl.

The last method was told me by an ancient midwife in Somersetshire, who assured me she had never known it to fail.

I am also indebted to the same good lady, Mrs. A. for some

interesting facts relating to the caul. She informed me that her sister was born with a veil or mask over the face, which was carefully removed and put aside by those present, special care being taken to prevent it coming in contact with the ground because of the bad luck which would follow. Later the "veil" was spread out to dry, then it was wrapt in tissue paper, labelled, and kept until the child was grown up, when it was given into her charge. She still had it in her possession when 76 years of age (1907), although it was reduced to dust and so small in amount that it could be placed upon a six-penny piece. She would not have parted with it on any consideration because it would bring her bad luck to do so. Mrs. A. also told me that if the "mask" is neglected at birth and thrown away, the child when grown up could see visions, foretell death, and have the power of "overlooking" people. She stated that her own nephew was known to have these powers for this reason.

Sea captains used to purchase these "cauls" because it was believed that no vessel with one on board could be lost, and it is said lawyers also used to buy them in order to attain eloquence, but the owner of a caul would have to be very hard up before parting with it because of the ill-luck that might ensue. Mrs. A. knew of five pounds being offered for one and refused. I know of a woman who recently sold a caul to a sailor for thirty shillings.

The following advertisements, copies of which I found in Brand's *Popular Antiquities*, prove the value that once attached to these charms:—

"To the gentlemen of the Navy and others going long voyages to sea. To be disposed of, a child's caul. Enquire at the Bartlet Buildings Coffee House in Holborn. N.B.—To avoid unnecessary trouble, the price is twenty guineas." *Morning Post*, August 21st, 1779.

"A Child's Caul. Price Six guineas. Apply at the Bar of the Town Shades, corner of Tower Street. The above article, for which fifteen pounds was originally paid, was afloat with its late owner thirty years in all the perils of a seaman's life, and the owner died at last at the place of his birth." *Times*, May 8th, 1848.

In Bristol I have seen the placenta of a primipara placed upon the fire in the lying-in room and have watched the young mother counting the big "pops" to ascertain the number of children she was to be blessed with. These "pops"



or "crackers" are caused by the bursting of any blebs that may arise owing to gas formation.

It is commonly believed among husbands that, in order to safeguard the child, the wives during pregnancy must be supplied with anything they have a great longing for. Some wives are not above longing for new hats.

A great many superstitious cures are still practised for whooping-cough. In Bristol it is quite a common thing to find a tarred rope securely fastened round a child's neck as a cure for this complaint, a timely warning to those responsible for the admission of patients to the children's wards. A more elaborate form of this superstition is to tie round the neck a godmother's stay-lace knotted nine times.

The following I give as related to me by a Cornish practitioner:—

(1) "The most curious and disgusting cure for whooping-cough I myself have met with was a piece of raw meat worn on a string around the child's neck. From the look and smell of the meat it must have been there a good many days when I saw it."

(2) "A lady living in Pol . . . . tells me of a somewhat similar charm she has known used:—Put a live earth-worm in a muslin bag and hang it round the child's neck. As the worm dies and shrivels away so the cough goes."

(3) "Another remedy used a year or two back upon the next-door neighbour's child. Take the child fasting three successive mornings and three times each morning to the nearest running water where the stream passes under the road."

I know of a case in another part of Cornwall where a child was taken "over fresh water fasting" in the early mornings which ended fatally in pneumonia. The child was considered by the parents to have been cured of the whooping-cough and to have unaccountably developed inflammation of the lungs. In another case, near Bristol, a child was taken to the end of the pier fasting in the early morning to meet the incoming tide.

A relative of mine was strongly urged by an old railway porter, whom she had known for years, to take her two children, who were suffering from the complaint, on to the

sands at a Lancashire seaside resort and to pass them three times over and under the body of a donkey. He declared that this cure never failed, and was quite offended because his advice was not followed.

A doctor in Somersetshire told me that he was once called in to see a small boy with whooping-cough whose mother said: "I have done everything for him that I can—I have drowned a fish, but he 'aint no better."

The same doctor told me of a cure for pneumonia that he had met with. Some sheep's lungs were placed round the patient's feet and left to rot—"as they rotted, so the inflammation was drawn out."

I have seen raw bacon bound round the neck for sore throat.

The belief in death warnings is widespread. The howling of a dog or screeching of an owl near the house at night have frightened many nervous people to death. The following story was told me by a bedridden old sailor:—

"On landing at Plymouth after a 13 months' voyage on a private yacht I found 'a large white lousy sort of insect' inside my vest which with all my other underclothing I had just put on clean. Ten days after my wife died. 'You see, sir,' he added, 'there be tokens of these things.'"

I have been told by a practitioner in Somersetshire, who had some personal experience of such proceedings, that in some parts of the county there is a belief that it is difficult or even impossible to die if there is a pheasant's feather in the bed, or if the bed is under a beam, and that it is not unusual to find in cases of lingering death that the bed has been moved from under the beam, or that the patient has been ruthlessly turned out of bed, to allow the neighbours to search the bedding for the offending feather. Death naturally is liable to occur soon after the latter proceeding, the result being that the neighbours are confirmed in their belief of this superstition for at least another generation.

Although the people are very chary of talking about it, especially to strangers, the belief in the power of the evil eye is still prevalent in many country districts. I know of a farmer in Somersetshire who gave up his farm and moved to another upon the advice of a magician. The driver of a

carrier's cart in this district was believed to have the power of "overlooking," and the people took good care not to offend this individual. I attended a patient who had been laid up for some weeks (white leg) and was supposed to have been bewitched by her own aunt.

The following examples of the belief in witchcraft come from Cornwall:—

Two sisters developed exophthalmic goitre within a few years of each other. Their mother told the doctor who attended them that she was convinced that it was due to their aunt who had cast the evil eye over them.

A child suffering from chorea was taken by her parents to a white witch in Plymouth, who advised them, among other things, to leave the neighbourhood. This they did, the father giving up a good berth in order to do so.

The truth of the following weird story is vouched for by another practitioner:—A woman frequently came to him complaining of pain and swelling in the tongue, but he could not find anything abnormal about it. Her son had married a girl of whom she disapproved and whom she had solemnly cursed. Nothing abnormal was ever found about the tongue at any time, either by himself or any other doctor (she consulted several), but she never ceased to complain about it until her death, which was mysterious—she just died, no diagnosable disease being discovered. Afterwards, the daughter-in-law told a local nurse that she knew the tongue would never get well because she had buried a rabbit's paw in a box and had said certain words over it. The deceased woman did not know that this had been done.

Vermin in the head are still by some attributed to witchcraft. The remedy is to go to some cross-roads (or to the nearest churchyard when people are coming out of church) and proclaim that "those who had sent their flock were to take them away again."

Rings made from stolen coins, coins collected at the Communion, or metal stolen from a coffin, were often used in olden times to cure fits, cramp, etc. Modern examples of the ring cure are sold in all chemists' shops. The free booklet supplied with the one worn by a relation of mine for many years strongly recommended that it should be worn



on the left hand because the heart and great vessels were on that side. I know a man who always carries a raw potato in his pocket to ward off rheumatism.

Charms for warts are numerous. A barber's assistant told me that the following performance caused his warts to disappear in a few weeks:—Take a bean, split it down the middle, and rub the moist surface over the wart. Then bury or hide the bean where it cannot be found, and tell no one about it.

Another one I have heard of is to make as many knots on a piece of string as there are warts, and then throw the string behind the back into a pond. When the string has rotted away the warts will have disappeared.

The next was told me by a doctor in Cornwall:—Put a number of pebbles in a bag—as many as there are warts—then take it out into the country and throw it over the shoulder not looking to see where it falls. The warts will then disappear. If anybody should pick up the bag of pebbles they will suffer from warts, “but nobody about here would think of touching a bag of pebbles for fear of this.”

The following come from the same place:—

1. “A man I know in P. went on three successive mornings to a well fasting and bathed his eyes, which were cured (disease not known).”

2. “Last year (*i.e.*, 1906) I was shown a stone which had often been used to cure eye diseases. The woman who possessed it had no belief in it, and told me that it was actually left her in her aunt's will. It was an ordinary cornelian bead and had evidently belonged to a necklace. Some years ago she was applied to for the loan of it as it had a great reputation in the neighbourhood.”

3. “A maid cut her finger while opening a tin, and at once buried the tin in the garden to prevent her finger festering.”

Many of these so-called cures are very disgusting. For example, to apply a fresh cow-dung poultice to relieve the swelling caused by an insect bite, and to eat snails “to strengthen the lungs,” are remedies that are far from pleasant. I once interviewed a snail picker on the road to Boroughbridge near Bridgwater, Somerset. He said that he tramped about twenty miles a day searching the hedges for snails. He carried

the snails in a sack upon his head and sold them in Bridgwater for 8d. a gallon. He found that he could earn from 2s. to 5s. a day. The Bridgwater dealer sent them to a Bristol merchant where they were cooked and shelled and sold at 1s. 4d. a gallon to glass-blowers and consumptives "to strengthen the wind." The snail secretion makes a splendid cement, and raw shelled snails rubbed into the back till they disappear are used to strengthen weak backs.

Superstition is rife in Welsh country districts. While acting as locum tenens in Carmarthenshire I was asked to snip a baby's ear for whooping-cough. On more than one occasion a small bottle of urine—tightly corked—was brought for me to look at. After a brief inspection I was expected to be able to send the appropriate medicine, or to tell from its appearance whether the patient was ill enough to require a visit. At each visit to a patient I was expected to cast a critical eye upon the little bottle of water which was always placed in the sick room. Whenever this important ceremony was overlooked the bottle was brought downstairs and thrust before me when leaving the house, but I was never expected to examine the specimen except by inspection. The importance attached to this proceeding is due to the quackery of the Water Doctors, who were a great power in the land up to quite recent times. There are many "in practice" even now. A typical specimen of the fraternity used to hold consultations in a public house in a village where I was stationed. Those who came with little bottles assembled in the back parlour and refreshed themselves from big bottles until the great man was ready to receive them. They naturally told each other all about the patients whose water they had brought with them, and the confederate among them was able to convey this useful information to his master, who was in this way once able to tell by a cursory glance at a bottle of urine that the owner thereof had the day before fallen down *eleven* steps and injured his *right* side.

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## A CASE OF LABOUR COMPLICATED BY UTERINE PROLAPSE OF THE SECOND DEGREE, WITH SUPRA-VAGINAL ELONGATION OF THE CERVIX.

By. B. R. B. TRUMAN, M.B., B.C., B.A.,

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THE patient, a multipara, aged 23, had become pregnant for the first time, in December, 1904. In February, 1905, when lifting a mangle, she felt something slip, and noticed a vulval protrusion. A ring pessary was inserted, but was not retained. She miscarried towards the end of April. In June, pregnancy occurred again. Labour took place in April, 1906, the baby being naturally born in the absence of the doctor. The perinæum was torn and was not sewn up. On getting about again, a stem pessary was tried, but was ineffective. She attended hospital in 1906, when a ventrofixation of the uterus was performed. On leaving hospital, the patient was no better, and she became pregnant again in June, 1908. I saw her for the first time in November, 1908. There was a condition of cystocele and rectocele, with some cervical descent. There was a scar, 4 inches long, in the mid line of the abdomen, between the umbilicus and pubes, to which the body of the uterus was adherent.

I inserted a Hodge pessary, which relieved the condition. Labour started about noon on April 3rd, and about 3 p.m. prolapse of the uterus of the second degree occurred, with the cervix quite outside the vulva, and inversion of the vagina. The patient was in this condition when I saw her at 6.30 p.m., and the prolapsed cervix, and vaginal fornices, were very swollen, red, and œdematous, and could not be replaced inside the vulva. The external os admitted one finger, and the cervical canal extended about 6 inches to the internal os, which just admitted the finger. The head could just be felt presenting, well above the internal os, and the membranes were unruptured, though no bag was then, or later, to be felt bulging into and distending the os. The cervical canal gave the impression of being not merely stretched, but also decidedly hypertrophied. The uterine fundus had sunk down from the ensiform cartilage, to between the position of the



6th and 7th month of pregnancy, and there was considerable antero-posterior bulging. The pains were throughout weak and ineffective, so, as there was no contraction of the pelvis, I administered ergot, and waited. Later on in the evening, the cervical canal had dilated to admit two fingers. Under chloroform I dilated the cervix by inserting the half hand. This pushed back the cervix and vagina inside the vulva, and the occiput was felt, with its greatest diameter above the pelvic brim. I applied forceps, with much difficulty, through the partially dilated cervix, rupturing the membranes in the process. By careful and slow traction the head was delivered in the occipito-posterior position, through the external os, which was pulled down again through the vulva the moment traction commenced, and a living child was delivered at 1.30 a.m. The cervix was unavoidably torn, but I did not repair it. The mother and child did well. I examined the patient after a month, and found the vaginal cervix, which seemed of normal length, split laterally on each side up to the fornices, and completely inside the vulva. There was the old condition of cystocele and rectocele, with slight prolapse of the cervix, on bearing down. This I treated by inserting a Hewitt's cradle pessary, which gave complete relief. The uterus seemed well adherent to the abdominal scar. In this case, although ventrofixation and perinæal repair had been done, the condition remained unrelieved, and was probably due to weakness of the broad ligaments. Possibly injection of the latter with quinine, as recommended by Inglis Parsons in the March 1909 number of *THE PRACTITIONER*, would have been efficacious. There seems grave risk of strangulation and sloughing of the cervix when the latter is nipped externally, and is irreplaceable, if the case is left too long without interference. If the cervix will not at first dilate sufficiently to allow forceps to be applied (or turning, in a transverse presentation), it is advisable to wait a little while, on the chance of sufficient dilatation occurring, as it did in this case. Herman considers that the cervix will dilate if one waits, though slowly. In using forceps one must bear in mind that the cervix is considerably stretched, as well as hypertrophied, and that there is risk of rupturing the lower uterine segment into the peritoneal cavity, if one uses much force.

## STRANGULATED HERNIA—HERNIOTOMY— SUPPLEMENTARY SPLEEN FOUND IN THE GREAT OMENTUM AT OPERATION.

By F. LOMAX WOOD, M.B., CH.B., D.P.H.

R. R., ætat. 31, a collier, had suffered from a right inguinal hernia for about two years, and had experienced great pain at times in the inguinal region when his truss failed to keep the rupture in the abdomen.

On April 17th he was at work about a mile from his home when a more severe pain than usual compelled him to cease. On examining his groin he found that the hernia had come down into the scrotum, and could not be replaced by any of his own efforts; he managed to walk with difficulty to his house about one o'clock p.m. I saw him about 4.45 p.m., and found that the hernia was strangulated, and had him admitted under my care in the Colwyn Bay and District Cottage Hospital, where with the help of Drs. Ryle and Russell, I proceeded to do a herniotomy, for I had already tried taxis without success at the patient's house. The hernial sac proved to be much thickened, except on its inner and posterior walls, where it was firmly adherent to the scrotal tissues; it was found to contain a large mass of omentum, a loop of congested small intestine and some blood-stained serum. When I was tying off the omentum in compartments before cutting it away I found a smooth dark-red body, about two inches long and one inch wide, between its layers, and was at first doubtful as to its nature, until Dr. Russell suggested that it was probably a supplementary spleen. On incising the mass, it presented to the naked eye all the appearances of splenic tissue and it was accordingly removed, along with the omental tissue in which it was embedded. The patient's convalescence was somewhat prolonged owing to the formation of a hæmatoma in the scrotum and abdominal wall, but the blood-clots were discharged at intervals through two apertures in the skin incision, and he eventually made a complete recovery.

I am indebted to Dr. Russell and Dr. Ryle for their assistance during the operation, and to the former for his suggestion as to the nature of the substance presenting in the omentum at the operation.

THE PHYSICAL EXPLANATION OF CERTAIN  
AUSCULTATORY SIGNS HEARD IN CONNECTION  
WITH MORBID CONDITIONS OF THE  
LUNGS OR PLEURÆ.

By HAROLD A. HAIG, M.B., B.S., M.R.C.S., L.R.C.P.,

*Late R.M.O., Essex County Hospital, Colchester.*

THE stethoscope enables the practitioner to detect morbid states of the lung or pleura, provided the conditions of the chest-wall are such as to transmit vibrations communicated to it from the contained organs; thus in cases where the musculature of the chest is markedly developed, or the thickness of the wall is relatively great, owing to other conditions, a certain amount of "damping" of the vibrations will occur at some parts, and a corresponding difficulty will be encountered in auscultation. In the normal thorax of the adolescent the conditions for the conduction and transmission of sound-vibrations are such that during quiet breathing only a faint "vesicular murmur" is heard, which varies in intensity at different points; thus it is heard more easily at the apices in front, and behind at a point on either side near the middle line which corresponds to the bifurcation of the trachea. In the latter case the conditions of conduction are enhanced by the presence of solid structures in the posterior mediastinum, which to a certain extent act as direct transmitters of the vibrations caused during the passage of air through the trachea and into the main bronchi.

Normal lung-tissue is not a good conductor of sound vibrations; spongy tissue very soon damps down these vibrations, and by the time they reach the pleura covering the lateral, posterior and anterior aspects of the lung, quite 50 per cent. of the vibrations in the smaller bronchi have been irregularly reflected or "damped"; moreover, by the time the remainder have reached the chest-wall, and affected the air of the chest-piece of the stethoscope, about 50 per cent. of these have been lost, and thus at the ear of the auscultator the air in the ear-piece will be affected by a very small per-



centage of the original energy of vibration. One practical deduction to be made from this is that in the binaural form of stethoscope the longer the connecting tubes the less the chance of diagnosing lung conditions.

To come now to the conditions which modify the conduction and transmission of sound-vibrations in the lungs, pleuræ, pleural cavity, and chest-wall, it is in the first place a well-known physical fact that gases, liquids, and solids conduct sound-vibrations unequally. Solids are the best transmitters, fluids come next, and gases last of all ; but although solids and liquids are excellent conductors of sound in a longitudinal direction, the amplitude of the vibrations is, as a rule, less, that is to say that solids and liquids "damp down" vibrations quicker than gases. This arises from the fact that the amplitude or intensity of the vibration varies inversely as the viscosity and rigidity of a substance.<sup>1</sup>

Applying these principles to the thorax and its contents, it is easy to explain some of the auscultatory signs met with in conditions of the lungs and pleuræ more frequently met with in practice ; thus the congested "solid" lung of lobar pneumonia has its capacity of longitudinal transmission of sound raised, more vibrations reach the stethoscope in a unit of time, and consequently the vesicular murmur is high-pitched, and is heard both during inspiration and expiration. The spoken or whispered voice is also reflected with greater intensity, and transmitted to the lung-tissue, appealing to the auscultator as either "bronchophony" or "pectoriloquy" ; if however, as is sometimes the case, the coincident pleurisy has led to the pouring out of an effusion of fluid into the pleural space the above signs will in all probability be masked by the damping effect of the fluid, although the character of the signs may persist, being lessened in intensity, unless much fluid is present, in which case they may be absent altogether.

In emphysematous conditions of the lung a good deal of the elastic framework of the lung has disappeared through atrophy ; thus the elastic tissue in the walls of the bronchioles and alveoli is much diminished, the alveoli themselves are distended with a mixture of gases, and the whole organ has

<sup>1</sup> The loss of intensity or number of vibrations is also often due to the abrupt change from one kind of tissue to another, or into a medium of less density.

become a much worse conductor of sound than is the normal lung. In this case, the vesicular murmur is distant, although adventitious sounds, such as rhonchi, are often to be heard. The diagnosis of cavities in a lung may at times be difficult ; a cavity at the apex having the size of a walnut would be reckoned a large space, and in such a case there would be as a rule unequivocal auscultatory signs due to the existence and shape of the space alone. Thus a peculiar hollowness in the breath-sounds known as "cavernous" or "amphoric" breathing is often heard, unless, as is sometimes the case, the branch of the bronchus leading into the cavity is blocked with pus, mucus, or a clot. The character of the sound transmitted is not unlike that obtained by blowing across the aperture of a hollow vessel.

The modification of the breath-sounds and vocal resonance by the existence in the pleural space of abnormal conditions can be readily explained on elementary physical lines ; a large serous pleural effusion causes such a marked "damping" of the vibrations that auscultatory signs may be nil. But where the fluid has special characters, viz., is purulent or largely fibrinous, a certain percentage of the vibrations may be transmitted. Percussion and inspection are of course diagnostic methods which should always be employed before auscultation, but the latter frequently detects points of extra value in the diagnosis.

The presence of air in the pleural space has the effect of diminishing, sometimes to complete absence, the vesicular murmur, but this is so not on account of any special "damping" effect upon the vibrations, but because these vibrations on passing from the lung to the air in the pleural cavity are partly reflected back and partly irregularly dispersed. The reflection at the surface of the lung is comparable to what happens when "total reflection" occurs at the surface of a liquid when rays of light pass from the liquid into a medium of less density. A sudden sharp impact, as of one coin against another placed flat against the chest, is however transmitted fairly well, giving rise to the "bruit d'airain," or "bell-sound" heard in pneumothorax ; and the "metallic tinkling" of drops of fluid in such a cavity is due to the better transmission of a succession of several such small sudden impacts. Such signs

are due rather to the reflection of the sound from the lung, after having traversed the layer of air in the pleural space, than to any sound transmitted by the lung-tissue.

Such sounds as rhonchi, râles of various characters, etc. are easy of explanation: the rhonchi are produced by the vibration of flaps of mucus set in motion by inspired or expired air, whilst the râles may be produced by the drawing of bubbles of air through muco-pus or pus, these bubbles occasionally bursting and giving rise to the form known as the "clicking" râle. The fine "crepitant" râle of early lobar pneumonia is chiefly of alveolar origin; it arises in the smaller bronchioles and alveoli, and must be produced relatively near the surface of the lung if it is to be heard. A fine pleuritic rub will in this stage often produce similar signs. A deep-seated pneumonia of lobar type may fail to give this sign. The solid lung of atelectasis often fails to transmit sound-vibrations, more on account of collapse of the bronchioles or blocking of the larger bronchi than from loss of its intrinsic transmitting powers; if, however, compressed solid or collapsed lung is forced up against the chest-wall, and is in communication with a still patent bronchus, bronchial breathing and the other auscultatory signs of solid lung will be obtained. Lung which is solid from a malignant growth in its substance will, if there be no great effusion of fluid into the pleural cavity, often give the usual signs; but in this case blocking of bronchi with growth or clot will frequently lead to diminution or absence of breath-sounds, etc. Growths of the chest-wall or pleuræ will also modify the auscultatory signs, "damping" of the sound being common. The auscultatory signs of early phthisis are, perhaps, amongst the most difficult to detect of any, and a diagnosis in such cases often rests more upon the combination of signs and symptoms than upon the local evidences. However, a slight but persistent diminution in the intensity of the vesicular murmur, and a raising of the pitch of this, together with evidences of the primary inflammatory reaction given by a few small râles on coughing and deep breathing, often give the signs a distinctive feature. The so-called "post-tussive suction" obtained by listening over a phthisical cavity in later stages of the disease is due to the sucking in of air again into the cavity as it expands after the collapse produced



during the effort of coughing ; it is a very distinctive feature in advanced cavitation.

The practical deductions to be made from the above few remarks upon the *rationale* of auscultatory physical signs in connection with the lungs and pleuræ are as follows:—

i. Each sign should be looked at from the point of view of its origin in a distinct pathological condition in the structures concerned, and not merely empirically.

ii. Auscultatory signs should be considered not as entities *per se*, but in conjunction with the other physical signs and symptoms of the case in hand.

iii. The instrument used for the purposes of chest auscultation should be as simple as is consistent with accuracy of observation ; many physicians prefer to use the unaided ear applied direct to the chest-wall, and in many cases this method is a valuable one. If a binaural stethoscope be used, the rubber and metal tube connections should be short, to diminish irregular damping and dispersion of the sound vibrations ; continuous metal connection tubes would be better than the change from metal to rubber which obtains in most stethoscopes nowadays. The ear-pieces should fit closely and accurately into the external auditory meatus, and the chest-piece should be of metal and not possess a wood or ebonite connecting piece<sup>1</sup> ; the edge of the metal chest-piece might be conveniently rimmed with hard rubber. The main point is to avoid unnecessary connections, and to convert the apparatus into a fairly rigid sound-conducting instrument.

<sup>1</sup> A chest-piece with a parabolic internal surface would possibly tend to focalise the vibrations and present a good deal of irregular dispersion.



## Notes by the Way.

### A Record Year.

LAST December we concluded the note to our readers in the following terms: "The commencement of another New Year will be upon us before our next number can appear. We anticipate its advent in an optimistic spirit, convinced that it will bring us opportunities of still wider usefulness." This optimism has been abundantly justified, for the year 1909 has been a record one for THE PRACTITIONER in every sense of the word—a record circulation, a record membership, and a record popularity.

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### he New Professional Centre.

THE first day of 1910 will see the inauguration of the New Professional Centre, of which we have already given our subscribers a detailed account in our October and November issues. The flowing tide of enthusiasm has been with us ever since the first announcement of our intentions, and there is no doubt that the centralisation in spacious offices, conveniently situated, of the business activities of the Profession will meet a requirement which has been widely and keenly felt.

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### *Locum Tenens.*

ONE further announcement in conclusion. We shall be glad to hear from those members of the Profession who are desirous, or who are in the habit, of taking *locum tenens* work, and we therefore invite them to communicate with us as soon as possible.



## Practical Notes.

PROGNOSIS IN DELAYED MENSTRUATION.—In a case of delayed menstruation the practitioner consulted will in all probability be asked to express an opinion on the likelihood of menstruation coming on. This forecast will depend in the first place on the age of the patient, and the following statistics, compiled by Bland Sutton and Giles from an analysis of 1,000 cases, will be a helpful guide :—

| 28·8 per cent. of girls do not menstruate<br>before the age of 16 |   |   |    |
|---|---|---|----|
| 13·7  | ” | ” | 17 |
| 6·1   | ” | ” | 18 |
| 3·3   | ” | ” | 19 |
| 1·5   | ” | ” | 20 |
| 0·9   | ” | ” | 21 |
| 0·6   | ” | ” | 22 |

Therefore, in the case of a girl of 16 or 17 years old, a favourable prognosis can be given without an examination of the patient being made, and Bland Sutton and Giles observe further that the prognosis must be more guarded and the effect of treatment watched in young women of 18 or 19 years of age; the percentages in the table show that after the age of 20 years no opinion should be given without having first made an examination. Moreover, in the consideration of a case of delayed menstruation, due weight must be given to the patient's general health, and, in the cautious language of the authors of the table, it may be said, if the girl be suffering from anæmia, tuberculosis, or other constitutional condition that may cause amenorrhœa, that menstruation will probably begin when the general condition has improved. Further, supposing the general condition to be good, and the patient to be 20 years of age or older, then the breast development and pubic hair should be noted, and though any marked deficiency in these secondary sexual characters is unfavourable still too much reliance cannot be placed on them, and an examination of the pelvic organs under an anæsthetic should be considered, for the probability is against the esta-



blishment of menstruation if the uterus is very small or rudimentary, or if the ovaries are small and infantile in shape.

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CANCER AND CHRONIC MASTITIS.--The importance of an accurate diagnosis in the case of a woman about 45 with a swelling in her breast has been emphasised lately by Mr. F. C. Wallis. The diagnosis may lie between a simple chronic mastitis and commencing scirrhus associated with chronic mastitis. It is a diagnosis which must be made with the greatest care, as in women about this age such breast tumours may have existed for some time as chronically-inflamed breasts, or portions of breasts, and then may become malignant. Unless these swellings disappear rapidly when the breast is treated with belladonna and kept at rest, the following operative plan should be carried out:--The breast and surrounding parts should be prepared for operation. A portion of the hard nodule is excised and immediately frozen, stained and mounted. A pronouncement can then be made within ten minutes from the time of the removal of the tissue, and on this verdict the question of further operation, namely, removing the whole breast, etc., will depend. Supposing the case should turn out to be one of chronic mastitis, it is, in the opinion of Mr. Wallis, better to remove the chronically-inflamed portion of the breast, which, if left, remains a constant menace of malignancy. When once a case comes under observation, it should never be lost sight of until the inflammatory condition has entirely gone. Some swellings have disappeared after the application of X-rays, and it would always be worth trying this before removing a chronically-inflamed mass--only it must be borne in mind that if any thickened inflammatory material is left it is a source of danger.

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## Notes from Foreign Journals.

### THE TREATMENT OF SCARLATINA.

After discussing the chief difficulties in diagnosis to be met with, Garlipp describes the methods of treatment in use in the children's wards of the Charité. Every case should be kept in bed for at least three weeks; for, even in cases to all appearance mild and running a normal course, there is no security against an unpleasant surprise. Every rise of temperature calls for a careful search for its cause, and, the practitioner must be on his guard, even when the temperature falls very gradually. The sick-room must not be too warm ( $60^{\circ}$  to  $62^{\circ}$  F.), and, whenever it is possible, the two-room treatment should be adopted. For delirium and stupor, warm baths with cold douching are ordered. Cold baths must be avoided, as they do not suit the children. When there is pyrexia to a degree requiring reduction, the cold-pack is used for from 10 to 15 minutes every hour. The parched lips and the region of the nostrils are moistened with the mucilage of quince, of the German Pharmacopœia. The throat always demands particular attention. The tonsils are extremely susceptible to the invasion of streptococci, as they have been deprived of resistance by the scarlatina toxin. By this path may gain entrance the dreaded scarlatina diphtheria, suppuration of the glands, severe phlegmon, and eventually general sepsis. Frequent spraying is necessary throughout the day; gargles are not enough, because the fluid does not get far enough back into the throat. The best mouth-wash has been found to be a 5-per-cent. solution of ichthyol, which, unhappily, has a detestable taste, but children soon get used to it. A 3-per-cent. solution of peroxide of hydrogen is also of good service. In the diphtheritic condition, injections of 3-per-cent. carbolic acid solution into the tonsils often prevent a more severe affection of the glands in the neck. Half-a-Pravaz syringe-ful is injected into each tonsil by means of a Taube's cannula. The injections must be left off if any signs of commencing necrosis appear round the site of the injection-wound. In more advanced swelling of the lymphatic glands, plasters of 50 per cent. ichthyol ointment are often of use. These glandular swellings are not incised too quickly, hot fomentations being used as long as possible. In making an incision, the skin will often be found to be much thickened. The ears, which are affected with alarming frequency, also require careful watching.

In the early stage of otitis media, it appears to be amenable to instillations of Glycerin. Acid. Carbøl (5-10 per cent.). If the least bulging of the tympanic membrane is noticed, paracentesis is performed at once. When the ear is discharging, and, suddenly, high remittent fever sets in, for which no apparent cause can be found by a careful investigation, disease of the mastoid is suspected. In children, no pain on pressure is, as a rule, obtained, and the upper wall of the meatus does not bulge downwards, although, in the subsequent operation, the antrum and its surrounding parts are found to be full of suppuration. If, therefore, the temperature remains high, and nothing can be found to account for it trephining the mastoid is performed

immediately. Delay is out of place, as it may lead to the gravest, not infrequently fatal, consequences. When any rise of temperature occurs, the heart must be examined for the presence of endocarditis, but the lungs are very seldom involved. During the end of the second and the beginning of the third weeks, the patient needs careful watching. Should any rise of temperature, even if only a few points, occur, the urine must be carefully tested. It is at this period that hæmorrhagic nephritis begins. It is not infrequently found at the same time that the glands of the neck are again swollen. This soon subsides without leaving any traces. In the Charité, the use of prophylactic doses of urotropin has been tried, but was found quite nugatory. When nephritis occurs, the child is given milk for some days, and then a salt-free diet, or at least one poor in salt. During the whole time that the kidneys are affected, the amount of urine passed is to be strictly observed, for it is only by this that the severity of the disease can be properly gauged. More or less albumen, and a small or larger number of cylinders are relatively unimportant. A decrease in the amount of the urine portends uræmia. The sovereign remedy for the prevention of uræmia is bleeding, and, since it has been used there systematically, no more children have been lost from uræmia in the Charité. As soon as the daily quantity of urine falls below 300 to 400 c.c. (10 to 15 ounces), six leeches are applied to the loins over the kidneys, and free hæmorrhage is encouraged after the leeches have dropped off. There is, as a rule, so much bleeding that acu-pressure has to be used to stop it.

If the amount so obtained is not enough for the purpose, venesection is performed on the following day. The bleeding must be freely made. As much as 200 c.c. (7 ounces) can be safely taken from older children. Hot-air baths are also of use. In some recent cases, a surprising improvement was sometimes obtained after lumbar puncture. All other remedies are superfluous, if not of positive harm through irritating the kidneys. When there is a larger quantity of blood in the urine, gelatine, to which raspberry vinegar is added to improve the flavour, is of advantage. Scarlatinal rheumatism is best controlled by aspirin, pyramidon, and the like, giving larger doses at shorter intervals. Serum-treatment cannot be recommended. No real effect has been obtained with any of the anti-streptococcus sera; even with Moser's polyvalent serum the effect is uncertain, while the introduction of such large quantities (200 c.c.) of horse-serum entails the danger of collapse, fever, and serum-eruption.—(*Therapeutische Monatshefte.*)

#### THE TREATMENT OF CORYZA BY MENTHOL.

Ointments containing menthol have been recommended in many nasal affections. The use of fatty substances in the nasal fossæ is often disagreeable. De Castres avoids the use of fat by dissolving menthol in chloroform, and using the solution for inhalation. A saturated solution is obtained by—

|               |   |   |   |   |     |
|---------------|---|---|---|---|-----|
| Mentholis -   | - | - | - | - | 3j. |
| Chloroformi - | - | - | - | - | 3j. |

Misce. Fiat mistura.

Solution takes place almost at once. A few drops of this solution are placed in the corner of a handkerchief, which is then held to the



nose for inhalation. The feeling of obstruction in the nose disappears at once. It is well to inhale through the mouth as well as through the nose. The patient should keep indoors, and take a whiff of the remedy every now and again. The final departure of the coryza is hastened by drinking several cups of hot and stimulating drink, which can be improved by adding some good cognac.—(*Revue de Thérapeutique méd. Chir.*)

#### THE USE OF ETHER IN DRYING UP SUPPURATIONS.

In the *Montpellier médical* is brought again into notice the method recommended some time ago by Souligoux for drying up suppurations. It is very simple, and appears to be far more active than the usual fomentation. The skin around the wound is scrubbed with a well-boiled nail-brush, and immediately upon the area thus prepared are placed several layers of gauze soaked in ether. The compress is completed by a covering of oiled silk and a bandage. Every hour one corner of the dressing is raised, and enough ether poured in to moisten the gauze. The treatment is continued for several days. The results obtained are constant. Suppuration in the course of evolution is resolved, and a cure is obtained almost with certainty in less than a week. Souligoux first used this method on a large abscess in the region of the neck. The following day part of the swelling had disappeared. The abscess was not opened, and had completely dispersed in four or five days.

Tillaux, in whose wards this method was tried, now treats all abscesses in the neck in this way, and finds that he has very rarely to use the bistoury.

The mode of action is unknown. It is suggested that the ether penetrates the skin, and acts, not only directly as a bactericide, but also indirectly by promoting phagocytosis.

#### ON THE RELATION OF THE AMOUNT OF ANTI-TOXIN IN ANTI-TOXIC SERA TO THEIR CURATIVE VALUE.

R. Kraus draws the following conclusions:—(1) that between the amount of anti-toxin and the curative value of the diphtheria-serum no fixed relation need exist; (2) a smaller curative effect belongs to the high degree (300–600) diphtheria-serum than to the lower grade (100–150); (3) the curative value, that is the avidity, of a serum does not appear to be dependent upon the increase and decrease of the amount of anti-toxin; (4) the avidity of anti-toxic sera is one of the principal properties of the anti-toxin, and should be considered in the estimation of the value; (5) the estimation, up to the present, of the value, according to Ehrlich, especially indicates the amount of anti-toxin, but does not take into consideration the curative value of the serum.—(*Wiener klin. Wochenschr.*)

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## Reviews of Books.

*Lectures on the Use of Massage and Early Movements in Recent Fractures and other Common Surgical Injuries.* By SIR WILLIAM H. BENNETT, K.C.V.O., F.R.C.S., Consulting Surgeon to St. George's Hospital, etc. Fourth Edition, with 23 illustrations. London: Longmans, Green & Co. 6s.

THIS is a new edition of Sir William Bennett's well-known book. Two lectures dealing with sprains and their consequences and rigidity of the spine replace that on derangements of the knee-joint, which has been omitted. The author was one of the first surgeons to advocate the early and constant use of massage in the treatment of fractures, and he has given a very clear and practical account of the method of using this treatment. In the chapter dealing with sprains the importance of first determining whether a fracture is present or absent is rightly insisted upon, and this can often only be done by an X-ray photograph. The diagnosis of the various causes of stiffness of the spine is discussed with much thoroughness, numerous practical details in method of examination being given. The illustrations greatly add to the value of the book, which should be read by all practitioners.

*A Manual of Operative Surgery.* By JOHN FAIRBAIRN BINNIE, A.M., C.M.; Professor of Surgery, Kansas State University. Volume I.: Operations on the Head, Neck, Nerves, Trunk, Genito-Urinary System. 713 illustrations, many of which are printed in colours. London: H. K. Lewis. 14s. net.

THE third edition of this Manual having been exhausted, the author has taken the opportunity offered him in the bringing out of another edition to divide his book into two volumes. The first volume—the one now issued—contains the operations on the head and neck, nerves, trunk, and genito-urinary system. The chapter on the nervous system has been entirely rewritten and enlarged, and considerable additions have been made in the chapter devoted to genito-urinary surgery.

The operations are described very concisely in steps or stages, a method which has its advantages. Many alternative procedures for each operation are given, and the author has drawn freely on the works of other surgeons, so that the book is really a compilation. There are numerous illustrations, some of which are printed in colours, and they add greatly to the usefulness of the book as a work of reference.

*Medical Inspection of Schools.* By A. H. HOGARTH, M.B., D.P.H. London: Oxford Medical Publications. 6s. net.

DR. HOGARTH has written a very interesting volume on what is at present both in London and the country a burning question. Nearly everyone is agreed that medical inspection of the elementary schools of the country must be organised on a more efficient scale, but there is divergence of opinion as to the best method of securing this end. Hence

Dr. Hogarth's book, which is a capable summary of every aspect of the subject, will be of great value to those who desire an acquaintance with the various problems involved. He gives a brief but excellent account of the history of the question, and of the stage of efficiency already attained in various countries of the civilised world. He offers a statement of the ideal policy to be pursued, and sketches what he believes would be an effective scheme of administration controlled by a central board. From these subjects he passes to the consideration of details of school inspection, the duties of the medical inspector and of the nurse, and devotes a special chapter to the school clinic. The appendices include documents of importance on the subject, and various forms and schedules in general or limited use. The book is well written, in concise and vigorous language, and we hope will be of service in carrying out the new schemes which it describes so well.

*Lectures on Diseases of Children.* By ROBERT HUTCHISON, M.D., F.R.C.P.  
London: Edwin Arnold. 8s. 6d. net.

THE second edition of these Lectures will, we have no doubt, share the popularity which the first edition attained. The author has included five new lectures, the most interesting of which is that on Congenital Pyloric Stenosis. His views on this condition are well known, and are at variance with some other authorities on the subject, so that it is particularly interesting to read his considered statement on the subject. He reiterates that "operation is never under any circumstances justifiable in these cases," and we believe that the best medical opinion in this country is, on the whole, in agreement with him, though perhaps hardly prepared to state the conclusion so dogmatically. In one respect we regret to find that this edition is distinctly inferior to the former: it is printed on paper of such a quality that both type and illustrations are blurred and foggy as compared with those of the former issue.

*High Frequency Currents.* By H. EVELYN CROOK, M.D., F.R.C.S., Barrister-at-Law; formerly Assistant in the Electro-therapeutical Department, West London Hospital. Pp. 232. 49 illustrations. London: Baillière, Tindall & Cox. 7s. 6d. net.

THE fact that it has been found necessary to publish a second edition of this book is in itself a valuable testimony to its merits and an indication that there are still those left who believe in the efficacy of high frequency currents for the alleviation of certain morbid conditions. At the present time the publication of this volume is most opportune, for of late the treatment of high frequency currents has fallen somewhat into disrepute, as a result of the tendency to exploit it as a cure for all manner of ailments.

The chief merit of the book is the excellent description which it contains of the physical properties and production of high frequency currents. This description has been brought thoroughly up to date and is adequately illustrated. The therapeutic section is less convincing and consists largely of quotations from more or less unknown writers. On the whole the volume can be recommended to all desirous of becoming acquainted with the present state of our knowledge of high frequency and its application in diseased conditions.





## Preparations, Inventions, etc.

### GEISSHÜBLER (MATTONI WATER).

(London: Messrs. Ingram & Royle, Ltd.)

We find that this natural gaseous water is mildly alkaline, with an agreeable sparkle, due to natural carbonic acid gas, and examination shows the presence of lithium, potassium, strontium, and sodium bicarbonates. This water is an excellent beverage for gouty subjects, and has an extended use in the dietetic treatment of patients suffering from certain disorders of the kidneys, liver, and stomach. It is a point in its favour that this water is palatable and refreshing, so that when ordered for patients there is no fear of any objection being raised on account of any unpleasant taste, and it is well suited for the dilution of wines and spirits. Mixed with warm milk or whey, this table water is suitable for the most delicate women and children.

### DIGALEN.

(London: The Hoffmann la Roche Chemical Works, Ltd.,  
7 & 8, Idol Lane, E.C.)

We have received samples of Digalen, which is the active principle of the *Folia digitalis purpurea*, and can be used by the mouth, by the rectum, intravenously, intramuscularly, and hypodermically. If the remedy diluted with fluid is taken on an empty stomach the effect sets in very rapidly. The undoubted advantages following the administration of digitalis are in certain cases obviated by the fact that digitalis preparations disagree with the patient. It is claimed that patients who are unable to take digitalis are found to be able at once to retain digalen, the reason put forward for this being that it does not irritate the stomach. It certainly would appear very advantageous to have the power of securing the therapeutical results of digitalis by means of a preparation that it is possible to administer in exact doses. The amelioration of the dropsical condition by digitalis is undoubted. But in the case of weakness of the heart in the course of acute infectious disease the quicker absorption of digalen renders it a valuable

means of securing immediate therapeutic results. It is further claimed in regard to digalen that it is so well tolerated by the gastro-intestinal canal and so rapidly absorbed that the cumulative effects of continuous digitalis treatment are thus avoided. The clinical results of the use of digalen show that we are no longer dependent on a combination containing various amounts of the active constituent contained in digitalis, but are enabled to use a preparation exact in its composition.

#### MERCURETTES.

(London : Messrs. Parke Davis & Co., Beak Street, W.)

A preparation styled 'Mercurettes,' otherwise known as *tabellæ hydrargyri cum oleo theobromatis*, has reached us. Mercurettes are oblong blocks in which metallic mercury is intimately incorporated with cacao-butter. Each block contains the amount of mercury present in one drachm of the ointment of mercury of the B.P., though in a somewhat greater dilution, which lessens the danger of irritation to the skin. Any quantity required for use can be readily apportioned by dividing the block. These mercurettes can be used for any condition in which the external application of mercury is indicated, but they are primarily intended for the inunction treatment of syphilis, for which purpose cacao-butter provides a suitable vehicle for the mercury.

#### "STERILLA" LIQUID SURGICAL SOAP.

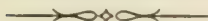
(Bristol : Messrs. Harold E. Matthews & Co., Clifton.)

Specimen samples of "Sterilla" liquid surgical soap have been submitted to us. This soap is issued in small nickel-plated flasks, and consists of a bland neutral liquid soap basis standardised to a Rideal-Walker coefficient of 1 by means of a combination rich in  $\beta$  naphthol, eucalyptol, and thymol. This soap lathers well, and the materials having been combined skilfully and with care, it is satisfactory and agreeable to use. This soap is practically odourless, it mixes readily, does not corrode instruments, is of use in filming mirrors, and possesses germicidal power. As a cleansing agent for surgical purposes it is convenient and efficient.



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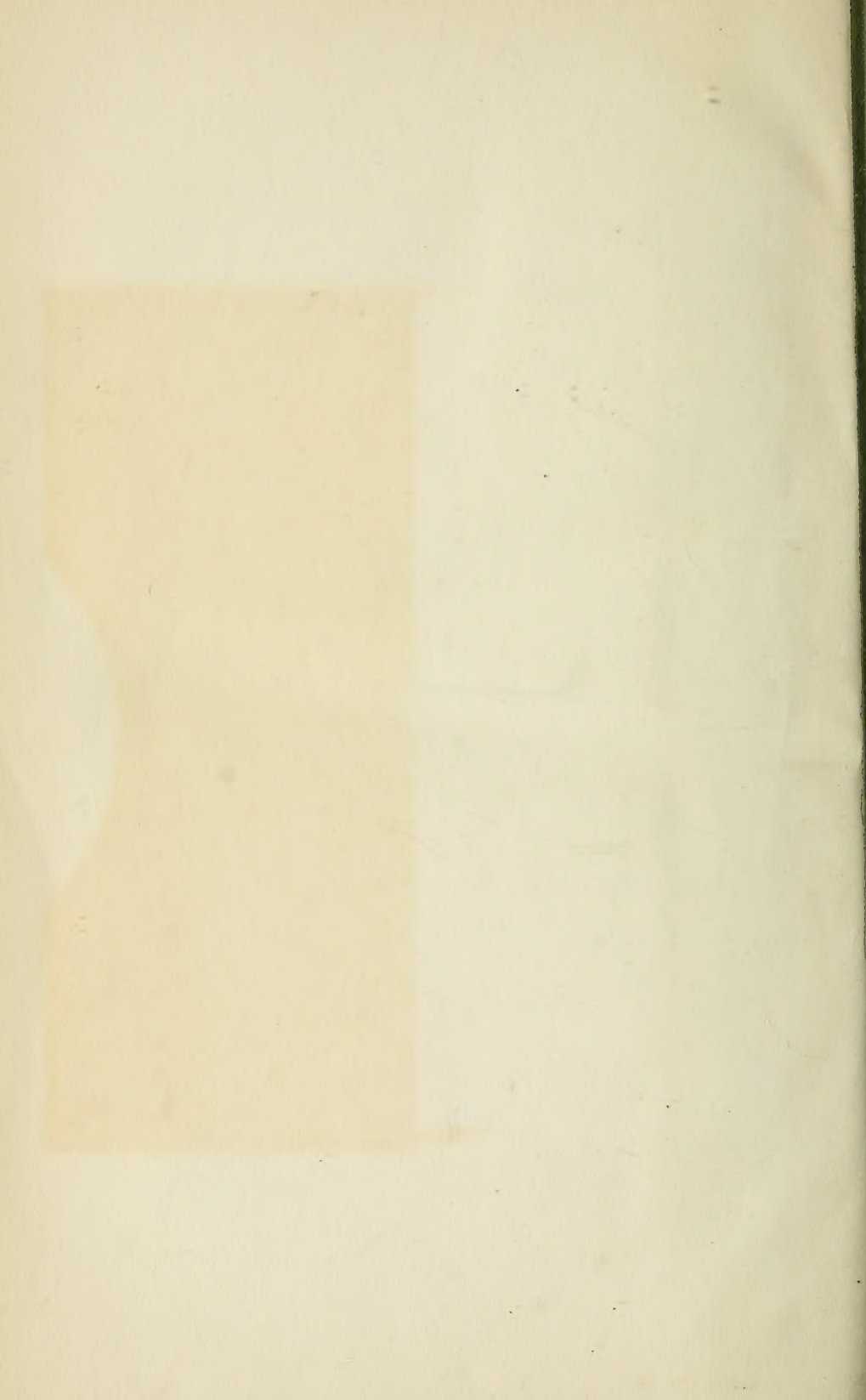














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